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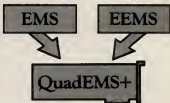
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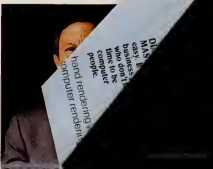




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COVER STORY

Project Database II

Barbara Krasnoff and John Dickinson A good database management system can be the most important and yet the most confusing acquisition a company makes. The perfect database must have enough power to handle large amounts of complex data and be accessible to nonprogrammers and computer novices. How do you reconcile these seemingly contradictory factors? In our second large-scale database project, we've extensively investigated today's

programs..... 106

Programmable Relational Databases

If your business demands highly intricate data manipulation or the creation of an individualized business application, then the database must be up to the task. These products are the crème de la crème: 32 complex programs with advanced relational capabilities and built-in programming languages. We show you how you can distinguish among them... 114



Relational Databases

What if you have complex database needs without the inclination to spend time programming? Today's relational databases are flexible enough to encompass most business applications. If you don't want to cope with high-level programming languages, you can find a satisfactory product among the 24 reviewed..... 184

Adding Speed and Functions to dBASE

Glenn Hart/Ashton-Tate's two database management systems, *dBASE II* and *dBASE III Plus*, continue to lead the DBMS market. Is there any way to improve these programs?... 229

PROJECT DATA BASE II

PROGRAMMABLE RELATIONAL DATABASES									
DBMS Name	Price	Language	Access	Indexing	Query	Report	Database	Database	Database
Adabas	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/2	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/3	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/4	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/5	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/6	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/7	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/8	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/9	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/10	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/11	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/12	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/13	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/14	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/15	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/16	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/17	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
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Adabas/VS/19	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/20	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/21	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/22	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/23	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
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Adabas/VS/99	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y
Adabas/VS/100	\$100,000	SQL	Y	Y	Y	Y	Y	Y	Y

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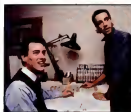
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WHAT'S INSIDE



If you were reading *PC Magazine* back in 1984, you will easily recall our first Project Database. That was one of *PC Magazine*'s first comprehensive review projects, encompassing seven issues and 66 database packages. Now, 2 years later, the database market is booming. This time, we were faced with over 100 database products (gleaned from a starting list of 280), many of which contained capabilities only dreamed of in 1984. But rather than simply repeat our previous methods, we tried to improve upon the first project's format.

Whereas the previous Project Database included a 17-page table containing vast amounts of textual information, this time we have used graphics and more concrete numerical data to make the table much easier to read and digest. This enormous task was guided by technical art director Gerard Kunkel (pictured above left with free-lance artist Ed Baumgarten), who labored over every bit of information, as he does on all charts and tables in *PC Magazine*. (Kunkel's efforts recently were recognized by *Graphic Design USA Magazine*, which awarded the Project Guide in Volume 4 Number 19 with its DESI award for design.)

Our reviewers this issue include many veterans of our first project who have a pretty good idea of the vast changes that have occurred in database management software. In fact, it takes a lot of experience, not to mention a bit of courage, to take on a project of this magnitude. Most found themselves learning at least five disparate database systems, running the gamut from *dBASE II* and its many imitators to the slickest menu-driven products.

There were the usual war stories connected with the review process. What can compare with the frustration of struggling through a badly written manual and awkward configuration file, to find that the package is not DOS compatible, not functional, or not even a true database? How do you cope with software that purports to be a corporate database, yet will not import files; that claims to be easy to use, yet requires full knowledge of COBOL?

The answer to all these questions is simple: you persevere. In fact, our reviewers did that and more—in their usual astute (and occasionally acidic) fashions, they examined, experimented with, and dismembered each database until they were able to write their opinion of the product as experienced users.

We realize there is still a great deal here for you to digest. One hint on how to proceed: first read the introduction and determine which database category—relational or relational with programming capabilities—is most likely to suit your needs. From there, a quick examination of the features table should narrow down the candidates further. The reviews will then give you a good idea of the product's "personality"—from there, you're on your own. ☐

The new Diconix 150. At under four pounds.
It's the one PC printer you can



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The output was

Microsoft Word

MINING THE SEABEDS OUR HISTORIC CORPORATE OPPORTUNITY

OVERVIEW

Most of the world's resources are still unexplored. Until recently, they were as remote as if they were hidden in another galaxy. For they lie thousands of feet below the surface of the ocean. Bauxite, iron ore, coal, uranium, tin, silver, platinum, and gold are all being recovered in commercial quantities through corporate operation beneath all the world's oceans.

Today, our own technological capabilities have combined with diplomatic concerns to make possible the full scale development of mineral riches on and beneath the seabed. It is a destiny we are uniquely positioned to fulfill.

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The Automated Mine—20,000 feet under the sea. Extraction of bauxite, molybdenum, chromium, palladium, silver, gold, platinum, and uranium.

TIMETABLE: PROFILE OF A THIRTY-YEAR MISSION

A commercially profitable prototype can be operated by 1980. The beginnings of a network of producing mines in every ocean by the second decade of the 21st Century is not an unreasonable expectation. Below is an estimate of the expenditures necessary to start us toward this goal over the next five years.

PROTOTYPE EXPENDITURES THROUGH 1980		MANPOWER	
YEAR	MATERIALS		
1980	\$1.2 billion	\$1.7 million	
1981	\$1.2 billion	\$1.4 million	
1982	\$1.7 billion	\$1.3 million	
1983	\$4.6 billion	\$6.3 million	
1984	\$10.7 billion	\$11.9 million	
Total			

never in doubt.

If what you see on the screen bears a striking resemblance to what you see beside it, that is no coincidence.

Because accelerating your ideas to a superbly printed page is the essential talent of our latest program, Microsoft® Word Release 3.

Microsoft Word 3 gives you a way to create professional-quality documents with speed and efficiency you may not have imagined possible on a PC. Or by any other means.

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Microsoft Word encourages you to marshal your thoughts right up front. With our exclusive built-in outlining program.

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Printers go to the limit for Word.

With Microsoft Word you can create at your desk the kind of documents not usually seen outside of a print shop.

Tap the stunning capabilities locked

inside the latest printers. Particularly laser printers with their abundant varieties of fonts, type sizes and special printing effects.

And what Word promises on the screen is what it prints. Underlines, **boldfaces**, *italics*, ~~strikethroughs~~, superscripts^{xy}, and more are all displayed as they'll appear.

A review of our stunning reviews.

Microsoft Word 3 is the most advanced version of a program which, since its introduction, has enjoyed extraordinary acclaim.

PC World picked its predecessor, Word 2.0 for its Pacesetters for '86 awards. And praised our product as "One full-featured giant (that) stands out from the crowd... the most influential product of the year."

Meanwhile, Peter Norton wrote in PC Magazine, "Microsoft's way of handling WYSIWYG [What You See Is What You Get] makes it the ultimate in word processing."

An answer for everything.

If you've ever drawn up a wish list for the ultimate word processor, put it next to our list of other Word features:

An index and table of contents generator. Five math functions. Sorting in columns, numerically or alphabetically, up or down.

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That's not just our opinion. In March,

Software Digest ranked Smart as the Most Powerful among all 15 leading relational data bases. Smart also topped dBase III Plus in tests of speed, versatility, error handling, and ease of learning.

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The difference is more than power.

	Smart Data Base	dBase III Plus
• Reversible Applications	Yes	No
• Multi-table Access	Yes	No
• Nested Menus	Yes	No
• Custom Reports	Yes	No
• Automatic Protection Against LAN "Deadly Embrace"	Yes	No
• Built-In Communications	Yes	No
• Not Copy Protected	Yes	No
List Prices:		
single-user	\$ 495	\$ 695
4 user-LAN	1,290	1,690
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tions are painless with Smart. Its built-in programming language relies on simple English commands.

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Smart also includes built-in asynchronous communications, cus-

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There are two ways you could make Smart more powerful than it already is: (1) by adding it to any number of workstations on a local area network, and; (2) by integrating it with *The Smart Spreadsheet*, and *Smart Word Processor*.



The Smart Data Base Manager

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When all else fails.

Most diskettes are pretty good.

And some of the time that's good enough.

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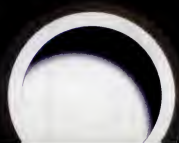
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LETTERS TO PC MAGAZINE



BROWN BAGGING IT

I was intrigued by the disk enclosed in your April 15th issue (Volume 5 Number 7). And I think that the product is certainly good.

I was less pleased, however, to discover that the word processor is identical to Quicksoft's PC-Write. I feel it is only fair to let readers know that it is possible to obtain PC-Write free from many user groups or at a cost of \$10 from Quicksoft itself. I seriously

question the integrity of your magazine's report not informing your readers of these facts.

I am also disappointed in Bob Wallace at Quicksoft for allowing his fine company, and his shareware concept, to be a party to this deception. C'mon, Bob, you're doing a fine job—don't sell out to the mass marketers.

J.P. Harrison
Hood River, Oregon

Sandy Schupper, president of Brown Bag Software, responds:

We do use portions of licensed code from Quicksoft, which also created PC-Write. But we also add substantial portions of our own code, including a resident spelling checker, a thesaurus, and a DOS front-end menu shell that allows you to run our program and other programs of your choice and also permits you to use DOS functions in an easy-to-use manner. We have a toll-free line and provide technical support 12 hours a day, 7 days a week.

In addition, most people should be aware that private labeling is nothing new

in this industry. For example, the IBM Assistant Series is actually the PFS: series with no changes or value added whatsoever. We feel that the value added by Brown Bag, which includes the enhancements mentioned above and technical support, is worth the extra \$14 we charge for our product. For those who think they don't have to pay for PC-Write, I'd like to remind you that although Quicksoft will send you its word processor for \$10, you're expected to pay Quicksoft \$75 if you like and use its package. And if you haven't paid the \$75, you're abusing Quicksoft's trust.

LASER PRINTING UPDATES

We would like to congratulate Glenn Hart on his excellent summary of the options available to PC owners with laser printers ("Harnessing the Laser Printer," PC Magazine, Volume 5 Number 3). However, we would like to point out a few things that are important to Laserjet owners.

Please note that the retail price for *LaserControl 100* is \$150 (not \$180 as printed). In addition, the address listed in the article refers to the engineering division. Sales and marketing are handled at 1024 Country Club Dr., #140, Moraga, CA 94556.

Randy Spurrier
Insight Development Corp.
Moraga, California

CAD PRODUCTIVITY

CAD systems exist primarily to increase the productivity and accuracy of people who make precision drawings. In his article "CAD: The Big Picture for Micros" (PC Magazine, Volume 5 Number 5), Glenn Hart did not compare the time it would take to draw the same image on the

different systems he evaluated. Had he done so, the results of his analysis would have been substantially different.

Admittedly, it is difficult to establish a standard drawing benchmark speed test for all CAD systems. Yet many independent



organizations, such as the American Institute of Architects, have sponsored CAD evaluations and have published their results.

Autocad generally does not place at the top of these comparative evaluations because its screen redraw time and complexity make it a slower system to use than many others. Conversely, *CADVANCE*'s "nested commands" that pan and zoom around in the draw, move, and copy modes greatly decrease drawing production time.

In short, Mr. Hart evaluated CAD systems as standalone software systems and not as production tools for producing precision drawings. In doing so, he provided a disservice to your readers who use these precision tools.

Stephen K. Swaney
Architect
New York, New York

Glenn Hart responds:

Your point is well taken. Benchmarks are an important method for comparing prod-

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FLOWCHARTS

And Organization Charts

Finally! An on-screen flowchart processor that knows about flowcharts and organization charts - not just another "screen draw" program that makes you do most of the work.

Interactive EasyFlow is a powerful full-screen graphics program dedicated to flowcharts and organization charts. With this program you can quickly compose charts on the screen. More important, you can easily modify charts so they are always up to date.

Features: • Text is automatically centered, character by character, within shapes as you type it • Text formatting controls allow you to over-ride the automatic formatting where desired • Lines are created by specifying the starting and ending points - the program automatically generates the route • Powerful editing facilities allow shapes and even entire rows and columns of shapes to be inserted or deleted; lines are automatically re-routed as necessary • Large chart size (up to 16 shapes wide by 16 shapes high) allows very large flowcharts and organization charts to be handled with ease • Charts can be larger than the screen - the window into the chart scrolls both horizontally and vertically as necessary • Flexible printer interface allows it to work with all

printers, not just dot matrix printers. Wide charts can be printed in strips Also works with Hewlett-Packard 7475A (and compatible) plotters • Twenty standard flowcharting shapes included • Common shapes supplied in three sizes • Extensive manual (125 pages) includes many examples • Context sensitive "help" facility provides immediate assistance at any time • Any number of titles can be placed on a chart • Commentary text blocks can be placed anywhere in the chart • Fast: written in 8088 assembler • Plus many more features than we can mention here.

Requires at least 256K memory, DOS-2 or higher and an IBM or Hercules compatible graphics card.

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The sample screen display shown below is typical of what you see while editing a chart. Other screen displays are provided for entering titles, changing options, getting "help" and so on.

STATUS BAR (not to be confused with a wet bar) tells you what Interactive EasyFlow is doing at all times.

TEXT MESSAGE WINDOW used to enter user text and to display messages from Interactive EasyFlow.

CURRENT SHAPE WINDOW - shows the content of the current flowchart shape (the one under the SHAPE CURSOR) in complete detail.

CHART WINDOW gives an overview of your chart: the example shows the "normal" view. "Close-up" view shows a smaller part of the chart in more detail. "Wide-angle" view shows a larger part of the chart at reduced size.

SHAPE CURSOR shows where you are in the chart. Cursor keys move it around; chart window scrolls if you run off the edge of the window

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VIEWPOINTS

LETTERS

ucts. However, CAD packages are designed for a wide range of disciplines from electrical, civil, and mechanical engineering to architecture and interior design. Since the needs of these specialties are so varied, the results of testing CAD packages based on a single drawing would prove too simplistic. Therefore, we chose to focus our comparisons on the features offered by each product and its compatibility with plotters and other equipment.

IBM GRIPES

Three cheers for Stephen Manes. His column "IBM vs. IBM" (*PC Magazine*, Volume 5 Number 7) is both timely and appropriate. My experience with the IBM AT's hard disk, backup problems, service problems, and IBM's unhelpful attitude is exactly as Manes describes it.

Francis M. Sand
New York, NY

NEITHER HUMOR NOR IRONY

What is even more irritating than Stephen Manes's column "Flossie or the Tractor?" (*PC Magazine*, Volume 5 Number 2) is Mr. Manes's reply to William Menchan in the Letters column in *PC Magazine*, Volume 5 Number 7. It seems that every time an offensive remark/joke/column is labeled for what it rightfully is, the perpetrator retreats behind the cry "Those feminists just don't have any sense of humor! Everybody else thinks it's funny!"

Well, I agree wholeheartedly with Mr. Menchan. I'm familiar with both humor and irony, and Manes's column had neither. It was cheap and offensive. His answer to Menchan was even more so.

Ashley McConnell
Las Vegas, Nevada

WHAT DID GET FIXED

I disagree with Jim Seymour's column "Lotus's 1-2-3, Release 2: What Didn't Get Fixed" (*PC Magazine*, Volume 5 Number 7).

I have been an accounting applications designer using spreadsheets ever since *VisiCalc* first came out and have used *VisiCalc*, *MultiPlan*, and *1-2-3* extensively. And I think 1-2-3, Release 2, is superb! Lotus did fix all of the major problems I had with Release 1A and added some other very nice features. Also, I fail to see how

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PC World
December, 1985

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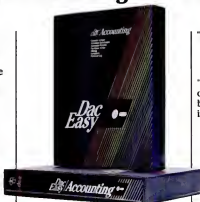
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PC Magazine
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VIEWPOINTS

■ LETTERS

anyone who uses this fine program professionally can complain about the \$150 upgrade price. It is well worth it.

Greg Trego
Boulder, Colorado

Jim Seymour's article on Lotus's 1-2-3, Release 2, was very interesting. I regret buying the update and wish I had my extra copy of Release 1A back, as well as my \$150.

H.P. Bloodworth
Doraville, Georgia

ORG HANGUPS

We were very pleased by the excellent review of our product *Org* in PC News (*PC Magazine*, Volume 5 Number 4, page 53). As you know, *Org* is a graphics program that automatically draws organizational charts.

However, the reviewer made one comment that we would like to address. It was stated that "*Org* sometimes hangs the computer on exit, requiring a power off/on cycle." After reading the review, we immediately called the reviewer to confirm the statement. We found that the system being used was loaded with an unusual number of resident utilities and special device drivers. When some of this other software and equipment was disabled, *Org* exited to DOS without incident.

Kenneth L. Hess
President
Banner Blue
Fremont, California

MONITORING PORTFOLIOS

Thank you for your in-depth coverage of investment software (*PC Magazine*, Volume 5 Number 7). However, I would like to point out some errors in your review of *The Isgur Portfolio System*. We do maintain futures, warrants, and mutual funds. We also have two extensive reports showing current market prices.

Mark Shapinker
Batteries Included
Richmond Hill, Ontario
Canada

I was delighted to see Thomas A. Meyers' article "Using Spreadsheets to Monitor Your Portfolio" in Volume 5 Number 7. But when I set up the spread-

sheet template, I found some flaws.

The formulas in I24, J24 and K24 all refer to the date in G14. That cell address must be expressed as an Absolute in these formulas in order to Copy them to the cells below them.

In addition, the percentage gain in K36 calculates out to .4406927 if you use the formula. I cannot figure out how Mr. Meyers got 79 percent.

James E. Henry
Camden, South Carolina

Thomas A. Meyers replies:

Thank you for bringing to my attention a typographical error. The total percent gain/loss of 79 percent as noted in cell K36 is calculated by dividing the total of the short-term and long-term unrealized gain/loss by the total cost. The formula noted at the bottom of the template for cell K36 should be changed from (I36+J36)/H36 to (I36+J36)/F36 to correctly reflect this calculation. Also, your change with regard to the use of dates should enhance the value of the template.

CORRECTIONS

In the review of the CalComp I043GT Plotter ("Hardware: Firm Support for CAD," *PC Magazine*, Volume 5 Number 5), two different prices were provided for CalComp's plotter. The correct price for the plotter is \$8,905.

In the article "Computing Options for Power Users" (*PC Magazine*, Volume 5 Number 4), an incorrect address and phone number were printed for Texas Instruments Inc. on page 140. The correct information is Texas Instruments Inc., Data Systems Group, P.O. Box 809063, Dallas, TX 75380-9063; (800) 527-3500.

HOW TO WRITE TO PC MAGAZINE

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Remote lets you run almost any program, from any location, as if you were there.

Remote is the software that turns your personal computer into a host computer. You or anyone you choose can dial it up from almost any terminal in almost any location, and run most popular application programs such as word processing, spreadsheets, and data base managers.

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While Remote itself becomes transparent in use, it offers some very tangible benefits:

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- Each of several different users can call in from anywhere in the world and use the host PC and software. Remote includes a sophisticated electronic mail system with encrypted messages and individual password protection.

- You can transfer files to and from the host computer, using the Crosstalk or XMODEM protocol.

- Programmers and software vendors can use Remote to debug a client's software by phone, without leaving their own offices.

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PC BRAND: CAREFULLY CHOSEN PROGRAMMER TOOLS

BRIEF Is Anything But. A Whopper of an Editor

With a name that belies its thoroughness, Brief™ has every feature you ever contemplated for your editor-in-chief. Text, from any keyboard or file, is housed in multiple buffers, and scrolled through one or more windows you open, close, resize. A text buffer may be called to different windows to view two areas at once. A change in one changes both. Text buffers may be inserted, printed, written to file, movement to scroll buffers for cut and paste into other buffers, or deletion, with as many "undo" levels as you want. To find and fix, Brief has text search, abilities making "grip" with wildcards for matching, indifference to intervening characters, acceptance of character ranges, even multiple choice of patterns and their replacements.

If you use Lattice, C86™, or Wizard, and have 386K, you can compile your C program without ever leaving Brief. It finds the lines with errors, and marches you through the text for repair.

Parts of Brief were written with its own Lisp-like macro language which has structure, 25-character variable names, conditional execution, loops, and you can actually read it! Nothing like the heretofore we've seen elsewhere. Bulletin board and public-domain disks with macros, Disk of context-writing macros comes from your purchases! Simply the best text editor you can buy.™ Directlink (Newslink \$19.95).

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Lattice: **195** **CALL**
UG60

MULTI-HALO Multi-Board Graphics Library

The premier graphics library that got the ball rolling for PC-based graphics and has grown so omnipresent that it supports over 25 including IBM's EGA and the 9 Revolution's hi-res series—and has a multitude of mouse and printer drivers. All that in each box. Separate C versions for Lattice, Microsoft, Atari, C86. What Does Multi-Halo Do? It does anything. A full "point" was written using it. Wonderful value for single license. Cordly royalties though for redistribution. Specify 386/85 & language. Latt: **195**, Hew: **199**.

dbc Lattice Library Maintains dBASE Compatible Files With the Power and Speed of C

dbc™ links C to dBASE. It creates and maintains files and their indexes which exactly replicate dBASE file design. So the program, dbc can read and update them. And the program, dbc can use any files created by dBASE. Now C and dBASE can operate on the same data bases interchangeably.

They operate under the widespread culture of dBASE installations to exploitation by C programmers. You too that method, and avoid the resident dBASE language, and gain all the advantages of C with this single product.

dbc's functions parallel all dBASE's file handling commands, many decomposed to give closer control. The material

WINDOWS for C/WINDOWS for DATA Give Your Program a Cleaner Outlook

Windows for C™ is a library of over 85 functions to add the power and practicality of window partitioning to your application. Unlimited windows, each defined in a C structure for easy reference throughout your program, can be made either to pop up or permanently overwrite the screen. Routines will scroll and highlight lists with arrow keys, will read and scroll ASCII files vertically and horizontally in windows, and even write to memory-loaded files of the screen.

Logical treatment of video attributes permits unchanged programs to run on color or monochrome. Colors of windows are set individually.

All functions are in separate modules; only those used are linked. Only buffers holding content or temporarily obscured windows occupy RAM, others released dynamically. TopView™ compatible. Best overall rating and fastest delivery in Fall Hunt/7/8 Tech Journal review of five windowing products.

Windows for Data comprises all of Windows for C but takes in data through the windows as well. At the high level a single function lets you specify per-pixel string, field length, data type, screen location, picture, target variable, then sets lesser functions scrolling to get and process a user's input — any of which functions are available directly. These are utilities to get system date and time, mess with strings, create your own field masks. Field options can require entry, prevent entry, permit ascent or overwrite, keep on until or overflow keystrokes, and attachment of field-specific help messages and functions you want called to display.

C-TREE B-Tree File Manager, Source Code, No Royalties!

C-tree™ has been around since 1979 (it became Digital Research's Access Manager™). That means seasoned, sturdy code which hasn't cracked under the weight of prolonged and widespread use. C-tree comes in C source code, revealing all you've ever wanted to know about how b-trees are written. Provided you hand it into your binary application, you can re-

compiler or validate entries. And you decide what keys will clear a field, jump to the next or prior, quit, etc. Options diverse enough that a set of "fields" can be made to behave like a Lotus™ menu.

Many comments. Free demo. Specify Compiler:

10150 Windows for C	195	199
10150 Windows for Data	195	129

C-WORTHY LIBRARY Fits Out Applications with Shipshape Interface

Many libraries launch foibles of function for small crafting — re-working of arrays, positioning the cursor, etc. C-Worthy, by contrast, is a formidable battle weapon for major C engagements.

The C-Worthy Library™ wraps an entire user interface around your application. Its full power can be summoned by only a few high level calls. Sound exaggerated? A single function call can set up a complete test editor in a screen window.

High level calls pop menus and scrollable choice lists to the screen, restoring the background when dismissed, and branching to the chosen activity in your application. A full function set handles doubly-linked lists defined by C structures. • Windowing facilities open portfolios of up to sixteen sets for viewing virtual screens larger than the physical screen. • Full content-sensitive help screen management takes on the choice. Keyboard entry routines look for the help key on their own and interrupt with pagable text win-

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PIPE THIS ONE ABOARD! PIPE THIS ONE ABOARD!

dows explaining what to do next. • Full error message interface sends error codes and the functions which return them to C-Worthy which counsels user, get to remove all that error-checking clutter from your code program.

Your application is nested in these powerful emulations to the outside world. C-Worthy's imaginative architecture then makes heavy use of C's pointers to functions to find its way into your application to set upon the user's request.

Separate utilities maintain help and error message text and lists in files. This text acquisition means applications can readily translate into foreign languages without reprogramming — doubly so because C-Worthy display routines automatically resize for text length.

Where the high level interface does not suit you, the low level routines are available as decomposed functions. All machine dependency such as key mapping is housed in interlanguage overlays loaded alongside the application at run-time. C-Worthy applications can thus run on a mix of PC and MS-DOS machines without recompilation.

C-Worthy hands you a consistent and intuitive interface and a revolutionary design approach. Nowell found it "played a key role and accelerated development" in making his "MailWare™" utilities available for users. "You owe it to yourselves to take a look." Binary Libraries. Others coming in ingenious demo call for it.

Ask for: **PC Brand**
T0500 **1295** **1249**
T0550 Nowell Network **495** **449**

CURSES Unix Style Screen Management

Curses from Lattice™ manages the screen of the PC like Unix™ curses. Library of 84 functions and macros parallels Unix with matching parameters. So your Unix program will feel at home when you move it to the PC, and programs created on the PC will be Unix compatible. Keeps any number of screen images in memory full or partial save. Supports color, all four memory models. Vast function set to get characters, wrap lines, scroll, blank lines, highlight, etc. Carefully follows Unix curses terminal orientation by re-painting physical screen only on your refresh command.

Ask for: L0550 Latt **1255**, Hew **199**, With Source: L0600, **1250** & **1299**.

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PRE-C

Through "Lint"-like Analysis Now on the PC

But users have always had "lint" to thoroughly clean programs before they disappear into a compiler.

Pre-C™ looks larger than "lint." It finds problems your compiler won't. Problems that a debugger will have trouble finding out. Even problems which will cause trouble with other compilers.

Pre-C finds all the syntactical trippiness that will blow out a compiler and much milder problems: code which will never be executed, casts with suspect conversions, variables declared as external but never used, functions never called, machine-dependent expressions which inhibit portability, obsolete usage.

But the big service of "lint" is this: Compilers work with one module at a time. They know nothing of other modules which only meet up at link time. Pre-C looks at all segments of your program at once and reports to you any inconsistencies of inter-module references like conflicting data type declarations, parameter lists in calls which disagree with the functions themselves in data type.

Pre-C uses the Unix System III compiler standard to guarantee maximum portability anywhere in the C world. Potential command line options relay each report during early coding when work is incomplete.

Use purchased binary libraries? Profile them for Pre-C and it will therefore assure that function calls from any C program are error perfect. A module writer using a large system development. Needs 128k minimum, 150k recommended.

Ask for:	Let	PC Brand:
POSIX	195	195

BTRIEVE

Queen-B File Manager Abdicates Royalties

This queen of b-tree file managers was unapproachable to programmers for whom royalties would run profit margins.

PLINK86 & PLUS

Dynamic Cache Overlays Maximize Memory Use

PLINK86™ joins the overload of overlay managers, now has a Plus version. As a linker Plink can be used with any compiled language which delivers Microsoft® link format object files. It yields automatic symbol tables and more memory maps than DOS LINK, but its overlay power has won its reputation as a miracle device. Plink86 slows large program into small memory by binding into your compiled program an overlay manager which knows how to swap modules of large

linked programs between disk and shared memory space. Plink86's straightforward overlay description language allows you to describe your overlay hierarchy in a structure permitting up to 4,095 overlays stacked 32 deep.

So if your program needs large chunks of memory, you no longer keepgo sales to folks who have less. But if you're assumed 128k, and you have 64k, Plink86-Plus™ knows to use extra memory as cache for overlays — at a low cost compared to disk swapping. It also can automatically restructure a displaced overlay with a subse-

quently called overlay module, and assign library modules to either a program's root segment or overlay areas.

Plink, the programmer's choice even when CPM™ was the poolish of

DAN BRICKLIN'S DEMO PROGRAM

Slide Show Your Latest Greatest Idea

Who is the inventor of the electronic spreadsheet called with a new program, we set straight up in our chair VanCaZ™ was for businessmen, but Dan's idea is for you programmers.

Ever had trouble putting a program idea into words? Programs are screens! Words don't show. The answer? Show your program as a procession of screens.

Since new programs make it easy to create slide shows that imitate a program's screens and sequential activity. Create a screen — a snapshot of your planned product as it runs. Anything goes: words, borders, box rules, menus and underlining of monoscrolls, foreground and background color on the CGA and EGA. Press a key and make a copy of this slide; change it a little, by a single character perhaps, to show the next instant of run-time, then copy the slide forward again. Create a whole slide show of your program in action. It will seem like the program itself is running.

Each screen is in a 30x80 character mode, not bit mapped graphics. All 256 characters and attributes are available from scrollable lists which pop to the screen. All commands are layered in Lotus-style pop-up menus, with frequent choices mapped to the function keys as well.

Screen areas can be blocked for cut and paste or filled with color or characters, even made to blink. Sides of all appearing segments can be made for overlapping on other slides, and any slide may have several overlays assigned to it. Slides can be studied, deleted, and many quick tools to save time, disk space.

Slides can be created at time intervals or in response to keystrokes, and depending on a user's response, you can tell the program

to branch anywhere in the slide sequence to create innumerable paths through your show.

Don't make your ideas struggle through coding to get to the screen. Lotus Demo is unavailable to prototype the program ideas you are about to write, to position all the labels, choose the color, delete, smooth out the keyboard imitations before a byte enters in code. Or load the "capture" utility into the operating system, snapshot the screens of any running program, and load an instant slide show into Dan's program.

Makes tutorial a snap.

Dan's Demo has blossomed throughout Lotus™, we hear. Lotus [was] my major test site," says Bricklin.

Each purchase entitles you to redistribute fifty copies of the slide projector program along with your show. Plain manual, no binder, to keep the price low because Dan thinks everyone should have one (his right). You'll wish he had Demo then and left VanCaZ for now (Needs 256k).

Ask for:	Let	PC Brand:
NX100	125	140

GREENLEAF LIBRARIES FUNCTIONS

New 3.0 has 225 functions in both C and assembly as well as its library format. We have versions for Lotus, Microsoft, C86, Mark VII. New emphasis on tighter functional groupings to maximize ease of use. Background of functions loaded whether used or not. Manual's 252 pages new help select functions, as do menus and bulletin board.

32 DOS extensions: file and directory manipulation for 2.0 and 1.1. 25 Screen Functions: screen, menu, menu, menu, chrome or color, palette, canvas, shape, postscript, clearing and scrolling, print get and put, read light pen. 60 String Functions: Manipulation of strings, including center and justify, efficient list operations which add, delete, and sort pointers to strings for top speed. 50 Graphic & Plotting Functions: Primitives to access all graphics, typeface, formatting, and fonts control. Plot keyboard status and function key assignment, time and date alignment, read registers, memory save, peak and peak.

Ask for:	Let	PC Brand:
30770	195	139

COMMUNICATIONS

Want your application to communicate with other users on a single data base? Now you can build asynchronous communications right into your C program! Over 60 functions and demo programs in both C and assembly source code with user manuals and a high level, with separate transmit and receive ring buffers (characters are automatically loaded at one end and transmitted from the other, or vice versa) for an arbitrary number of ports. Interrupt control means you can download a record, then halt the incoming stream to file it, display it, let the user interact with it, send a byte back, let it all happen within the context of your program. Goodbye separate communications software.

The Greenleaf Comm Library supports C or binary, any parity, any word length, 8251 UART, all four Lattice C memory models, Hayes 300,1200,1200B and other modems.

In 80-page manual has examples of each function and grades you through asynchronous communications.

Ask for:	Let	PC Brand:
30770	195	139

BASTOC

OPTIMIZES!

Translates BASIC Programs Into C

For a trifling price, BASTOC™ will move truckloads of BASIC code over to C as a translator which takes in Micro-machines II or C86 or C64 code as written by Kenningham & Ritchie C for the Lattice compiler. It will optimally convert your program into a single monolithic C function or will decompose it into separate functions, one for each DOS/BIOS label.

Version 2.0 adds optimization, with dramatic reductions in execution time. It converts to C integers those numeric variables it finds in BASIC programs which really do not need floating point. It eliminates unreachable code. Where BASIC uses full assignment statements to increment and decrement counters, BASTOC converts to C's compact form, nested in other statements. Strings are dynamically allocated in the target program, adding your application of BASIC's constant limit for garbage collection.

BASTOC will lay out complete structure of even the most convoluted BASIC code, and writes any indigestible statement into the C output as a comment accompanied by an explanation of the problem. Also, you can optionally tell BASTOC to insert BASIC source lines in the C target as comments, a handy way to learn the differences between the languages.

Specify:	Let	PC Brand:
30375 & Which BASIC	145	139

PANEL

Feature-Laden Screen Design Tool

The newest version of this premier programming tool lets you layer up screens with up to ten overlapping images, making it easy to background a screen with pop-up lists, help boxes, and alternate sets of input fields.

Writing your own screenware is a good way to blow completion dates and profits. Panel™ works with you interactively to set up toolproof screen displays and data entry forms rapidly. It lets your form to prove that (and test data) before compiling, then converts the finished work into C source code for incorporation into your application. Compile with Lattice or Microsoft.

Wonderfully diverse attributes may be selected for any field — size, data type, color, of course, but also conversion of input to upper case, clearance of existing data when new entry is started, masks for standard formats (eg, dates, phone numbers), a choice of styles for numeric fields, phrases which fill in when their last letter is typed, multiple-choice lists from which to choose a field fill-in, search for a high-logged box. Fields may be multi-lined (eg, name and address at one field) and scrolled if larger than the screen space allowed them.

Panel builds in a user interface for keyboard movement within and between fields, and supplies extensive validation routines for checking user field entries — an source code, so you can tick on your own unique variants. Screen designs may be dynamically loaded from file, or compiled into a program, and version 6 has optimized code to quickly display speed. The user interface package is wrapped in a menu and keyboard customization package to tailor your application for other equipment. Panel A superior productivity tool now bigger than ever.

Ask for:	Let	PC Brand:
30400	125	129

Code	Product:	Let	PC
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S0499	Plink86 Plus	195	139

Code	Version	Let	PC
S0650	Greenleaf	195	139
S0652	Network	195	139

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RUN/C PROFESSIONAL VERSION

Interpreter Now Accesses Binary Libraries

RUN/C was an innovator for converting and successfully compiled C to an interpreted language as easy to grab hold of as BASIC. Great for learning, but a problem remained for pros: An interpreter expects nothing but source code, and that put the vast resources of professional binary libraries off limits.

No longer. RUN/C Professional™ has the tools dynamically to load and unload multiple binary function libraries while in its interpreter. Your code can now reach for functions in the commercial C libraries like C-Food Smorgasbord™, a C approach—potentially any library compiled with Lattice's large model. How? The manual shows how to develop the interface to a library, using the Lattice compiler (a must). How about your own archive of functions? No reason why not.

The RUN/C Interpreter

The interpreting engine lies at the heart of both the improved original RUN/C and the new Professional version. Its creators had the inspiration to make once formidable C behave on screen much like PC BASIC with a full-screen editor like WordStar. Just create a program and RUN it. If it stumbles, LIST it, EDIT it, add lines, delete lines, RUN it again, fix it again. Use familiar commands like LOAD, MISC, SAVE, FILL, even TRON and TRACE, and a free profiler.

RUN/C is ideal for rapid program development. Put up code at high speed, make and re-arrange, try out things devs may care, and let RUN/C find your typos and malapropos.

RUN/C has a treasury of functions built into the interpreter—over 150 paralleling the most used functions found in standard compiler libraries. So when and if the time comes to compile, your source code will find counterparts that are little more than C preprocessor interrupts, a shell command to invoke any operating system command without leaving RUN/C, even the ability to load a preferred editor in parallel and switch back and forth.

RUN/C Standard Version

Straight RUN/C has all above but the Loadable Libraries™ docking module & utilizes source code only, whether created by its own editor, or from any ASCII file, such as programs you've already written, or commercial libraries which supply source code.

It makes a splendid teacher. The manual has not just instructions how to use RUN/C, but its 500-plus pages provide a thorough-going demonstration of the C language itself. Every feature, of C or RUN/C, is accorded its

own micro-chapter. Over 100 of these chapters are devoted to RUN/C's built-in functions, and every one lists a sample program showing how it is used. The programs are also on the disk. So as you read them in the manual, you can run and put the vast resources (Nuclea 180k-256k recommended.)

RUN/C Professional

RUN/C Pro has every feature of RUN/C regular plus the binary library link-up and an extra level of debugging aids. They are ingeniously installed behind a built-in function, so you can call for debugging conditionally. The called function paints a menu of debugging tools to choose from, including immediate mode to display variables, single-step tracing, and changing of variables. RUN/C Professional can tackle projects of any size. Use it as a creative front end to feed a continuous stream of source code into compiled modules. Only the source code in progress is still interpreted, the finished product will be what by at object speeds. It will change how you work. (300k minimum & 512k recommended to fit memory.)

RUN/C, quite a run for your money

Ask for	Last Price	PC Brand
S090 RUN/C Classic	\$120	\$109
S090 RUN/C Pro	\$250	\$185

The GSS GRAPHICS SYSTEM

Leave the Driving to GSS

ANSI CGI STANDARD

GSS™ has reconfigured two components of its comprehensive graphics tool set to conform with the new ANSI Computer Graphics Interface (CGI) standard.

At the heart of the system is now the Developer Toolkit, which contains all language interfaces and device drivers for keyboards, mice, joysticks, tablets, printers, plotters, cameras, and more. Drivers now house all management of vector graphics (plotters and bitmaps) used by raster input devices (cameras) to emulate completely the application program from concern for device idiosyncrasy. No one else has implemented CGI that way. It means programming remains generic, just switch drivers and the same program will drive a different device, including intelligent controllers which do not want micro instructions.

GSS Kernel™ conforms to level 2b of ANSI's Graphical Kernel System (GKS) and contains all its device drivers and language bindings. Kernel has macro level tools to draw and color an object, store the sequential instructions, and recreate the object on its own, as well as segment it, transform it, etc., all the while returning data on attribute settings, style and device status. So powerful, a single command may represent several object lower level statements.

Plotting has the equivalent: GKS tools for graph and chart generation and their cap-

LATTICE C VERSION 3.0

Major Upgrades to the Best Selling C Compiler

Lattice has labored and come forth with the long-awaited Version 3.0 of its top-rated compiler. A long list of enhancements, adoption of the ANSI draft standard, documentation revised by few, and add-on libraries matched by more than a shorter quantity restore Lattice C™ to its leadership role as the C compiler to beat.

Lattice now embraces key UNIX™ enhancements which have entered the language since Kernighan & Ritchie: void functions returning no value, enumerated data types to assign stepped values to variables, the ability to pass data between structures by assignment statements, And 3.0 adds checking of external function arguments by data type as proposed by ANSI to kill bug warnings when modules join up at link time.

The greatly expanded libraries, now comprising 325 functions*, enable the file sharing and record locking provisions of DOS 3.0 to provide a full complement of transcendental, and a host of utilities to mimic the UNIX and XENIX™ environments.

Lattice now delivers smaller EXE files, cutting one past compile, boasts very fast link times and a more efficient assembling algorithm.

The compiler now defaults to the ANSI proposed standard when you select a strict mode, but command line options tolerate straying. New option generate code to use 80186 and 80286 features, and the

8087 is of course sensed and utilized if aboard.

Lattice has enjoyed pre-eminent status long that developers have created far more tools to marry into Lattice C than any other compiler. Programmers now have an enormous resource of libraries and utilities to use with Lattice to speed their work. William Hunt, in his exhaustive analysis of 12 compilers in the 1/86 issue of the PC Tech Journal awards Lattice the only "very good" rating for add-on library availability. He sums up with this all-around accolade: "A fine product to consider for the production of important applications."

Ask for	Last Price	PC Brand
S100	\$300	\$CALL

BETTER BASIC

New Version Compatible with Microsoft BASICs

The hearty implementation provides a real alternative to technical languages like C. It meets the most useful features of C, Pascal, and Modula 2 into BASIC, while retaining the familiarity of a language already known to millions. And now Version 3.0 is 100% compatible with Microsoft's GWBASIC and IBM BASIC, including graphics, sound, and assembly language calls. Just load old programs and run. Save and they are converted to BetterBASIC.

It's big. BetterBASIC's hugely expanded features require 192k; your programs can go all the way to the PC's full 640k. It's sturdy. Behaves like Microsoft BASIC at the interactive level, with a full screen editor, direct statement execution, and always poised to RUN it's fast. It's an incremental compiler—ables with increments each statement is checked and compiled just once. The Sieve benchmark runs faster than with Microsoft.

BetterBASIC™ is C-like with references to ensure records as any goodbye to FIELD, MKII, CVD, LIST, etc. It has "procedures" summoned by name unlike GOSUBS. Lots more features: built-in linker for compiled modules, trace, debugging breakpoints, cross-reference command, 32k arrays, DOS and BIOS calls and interrupts, recursion.

Ask for	Last Price	PC Brand	Ask for	Last Price	PC Brand
CS010 C/CS Divalent Toolkit	\$295	\$239	S1200 BetterBASIC	\$99	\$169
CS020 Kernel System	\$495	\$419	S1201 Run-time Module	\$295	\$239
CS030 Plotting System	\$295	\$249	S1202 8087 Interface	\$99	\$89
CS040 Metatile Interpreter	\$250	\$209	S1203 Bnuve Interface	\$99	\$89

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■ EDITED BY GUS VENDITTO

PC ADVISOR



Help for readers in choosing the best protection for floppies and how to save incoming data all day while running other applications.

BACKUP PROTECTION

I have a multitude of software programs and have backed them all up and keep the originals in a safe deposit box at the bank. My concern is for the originals. Is there a product on the market that will protect my originals from magnetic fields, radiation, or other possible damaging effects? I am not too concerned about fire because of the bank vault's construction.

Art Merriman
Cannon Beach, Oregon

I don't think you could get better protection against radiation than in a bank vault. But I have to wonder why you go to so much trouble. Confidential and hard-to-replace data disks might be worth the trouble, but original program disks are not. Since they're not copy protected, why not just make two or three extra copies?

Probably the greatest threat to a floppy's data is always at hand. The human finger touching the floppy's "sausage hole" has relegated more bytes to oblivion than all the X-ray machines, radios, and magnets that have passed near—but just out of range of—those same disks.

Your best protection is multiple backups—kept at different locations—and proper handling. No location is 100 percent safe. After all, if the bank's heating system goes awry, your data will melt like ambition on a beach.

One good data insurance policy comes from Polaroid (Cambridge, Mass.; (800) 241-4403). Owners of their floppies are entitled to a free Data Rescue service. Polaroid will run eligible damaged disks

through a clean-and-search system that can revive data made inaccessible by physical abuse (including heat). Radiation damage can't be corrected by Polaroid or through any other process we know of.

A lead shield is the most sensible protection against radiation damage (including electromagnetic and radio waves). You can order one from ComputerScooter (Jersey City, N.J.; (201) 659-3113; \$125); it's a leather-lined portfolio that will fit 16 floppies inside its lead-impregnated vinyl casing.

TELEPHONE MANAGEMENT

I am using a NEC 16/48 phone system that provides a readout of all outgoing calls through an RS-232 cable going directly to a printer. My problem is I have no way of sorting the readout by department or extension number.

I have been working with an Apple computer for several weeks trying to write a program to allow me to accomplish this, but it's proved to be more than I can han-

dle. I can save to disk and sort, but I lose information while the program is saving to disk because the phone system keeps sending more data.

I have decided to use an IBM PC if I can find appropriate software. This is a school district, and we can't afford a \$4,000 call-recording system. Can you help?

Anthony J. Brzezinski
Bath, New York

A good communications program would be able to save this steady stream of data to disk on a PC without losing any, although you could find one to do it on an Apple as well.

Crosstalk from Microstuf (Roswell, Ga.; (404) 998-3998; \$195) and Softerm 2 (Softronics, Colorado Springs, Colo.; (303) 593-9540; \$195) will do the job, and both are available in IBM PC or Apple versions.

If you decide to upgrade to an IBM PC for more computing power, Relay Gold (VM Personal Computing, Danbury, Conn.; (203) 798-3800; \$225) is probably the ideal communications package for you. It can save the constant flow of data from the phone system in the background while you run other applications (word processing, spreadsheet, database, whatever) simultaneously.

ASK THE ADVISOR

Send your questions about hardware and software choices you are facing to The PC Advisor, *PC Magazine*, One Park Avenue, New York, NY 10016. Or write via MCI Mail to G. Venditto.

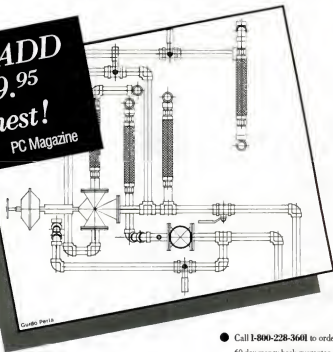
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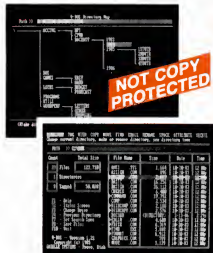
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QuickDOS is easy to learn.

There are several competitive programs that claim to help you, but most of them were designed with the very experienced user in mind. You have to be a professional programmer to understand them. If you select the wrong program, the "learning curve" could eat up all the extra time you thought you might save — and even then, these other programs are much slower.

QuickDOS helps you when you need help. And when do you need help most? When you are in the middle of a command! Our context-sensitive help system (over 75,000 bytes of help) will tell you everything you need to know about any command or feature of QuickDOS — you won't need to read the user's manual (we give you one, anyway) because it is displayed on the screen when you need it.

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File Manager Comparisons	Quick-DOS	Path-Minder *	Xtree *	Window-DOS *	Direc-Tee *	Keep-Track *	dir *
Sort and redisplay 262 files (in memory) by name	.9 sec	25.5	2.1	6.5	85.4	4.6	2.8
Scan disk, display map of directories on drive C	7.8 sec	20.7	24.2	23.0	29.1	37.3	n/a
Same as above, but on a Bernoulli* drive	2.7 sec	9.1	12.9	12.9	14.8	15.5	n/a
Return to file mgr after running a program (1)	0.1 sec	24.0	24.2	n/a	2.8	.7	1.6
Copy 23 files from drive C to drive A	34.0 sec	40.2	38.0	41.5	74.1	51.9	43.7
Start up program and find a file — maximum time (3)	12.3 sec	88.4	26.1	27.0	47.4	39.2	n/a
Show files on drive A, then return to drive C (1)	1.3 sec	40.3	25.5	12.4	5.5	39.2	7.1
Can be used to backup your hard disk?	YES	NO	NO	NO	NO	YES	NO
Intuitive on-line help in middle of commands?	YES	YES	NO	NO	NO	YES	NO
Is user manual available on the screen?	YES	NO	NO	NO	NO	NO	NO
Price	\$29.95	\$39.95	\$49.95	\$49.95	\$49.95	\$79.95	\$95.00

(1) This shows the flexibility of the program; the time shown does not include the 2 or 3 second response time of user

(2) PC-DOS 3.10 took 36.7 seconds

(3) Norton Utilities' "file find" program took 24.9 seconds

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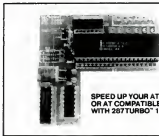
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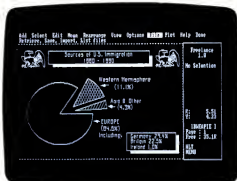
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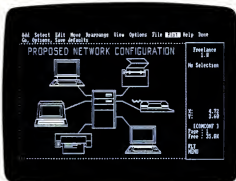
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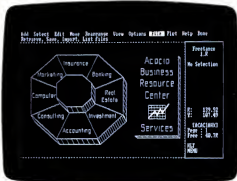
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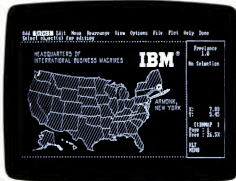
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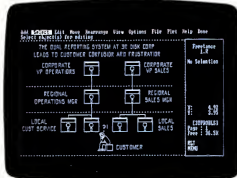
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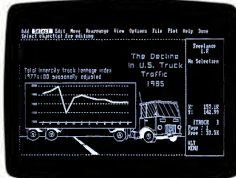
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"Because of its flexibility, its quality, and its ability to edit 1-2-3 charts, there aren't many products which can be considered competitive with Freelance. In many ways, Freelance represents a completely new conception of what a graphics program should be." Datapro Research Corporation.

Datapro Research Corporation is the biggest, toughest, most respected group of computer product evaluators in the industry. They know a thing or two about computer graphics. Their job is to render independent and highly objective assessments. They don't owe anyone any favors. Datapro just conducted an in-depth, hands-on evaluation of Freelance, a recently-introduced graphics package from Graphic Communications. They subjected Freelance to a barrage of tests, appraising everything from basic and advanced functions to the instruction books. They looked at it from every angle.

Then, they rated Freelance the Number One business graphics package.

Here are a few more of Datapro's conclusions.

On Freelance and Lotus 1-2-3: "Here is a program that can not only create free-form charts, but it can also edit the graphs produced by Graphwriter,* 1-2-3 and Symphony* to produce quality images that rival those produced by expensive graphics services."

On Ease Of Use: "Freelance really is different. It is a powerful graphics program that can produce high-quality images, but it handles graphics in a way that will seem natural to even the most novice user"

On Freelance's Symbol Library: "The range of graphic elements offered by Freelance is incredibly powerful, and the ability to use and create special symbols means that even the most pedestrian user can create impressive looking charts."

On Love at First Sight: "Here at Datapro, we use a good many programs in the course of our software testing but there are only a few that become our favorites. Freelance has been in constant use ever since we got our first prerelease copy in late last summer, and we will continue to turn to it again and again."

What is it about Freelance that can drive such a rigidly objective group of researchers to such heights of enthusiasm? Whatever it is, it's worth investigating.

In the words of Datapro, "To anyone interested in presentation-quality graphics, Freelance is worth a serious look." For your free copy of the full Datapro Report on Freelance, just call or write Graphic Communications, 200 Fifth Avenue, Waltham, Massachusetts 02254.



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Comdex: Low-Cost EGAs, ATs, but Little Software

PC ANALYSIS

New products strengthen the role of AT-type PCs as powerful graphics machines.

BY CRAIG L. STARK
AND BILL HOWARD

ATLANTA—Some people say Comdex is the bellwether of the future. Certainly Spring Comdex was a forward-looking show. People were looking forward to Fall Comdex, where they might see some real advances in the personal computer industry.

The closest thing there was to a trend was the PC's newfound ability to function as a bit-



Spring Comdex in Atlanta played host to an industry focused on hardware.

mapped graphics machine, which requires a faster processor and more memory than character-based applications. Nowhere was the trend more evident than in desktop publish-

ing. And it wasn't the repeating borders and grainy dots of an Apple Macintosh hooked up by MacDraw to an Image Writer, but the promise of serious, Fortune 2000 desktop publishing

possibilities resulting from the maturation of under-\$3,000 scanners, EGA-equipped PCs, and yet more laser printers.

Forward looking? Spring Comdex, held here April 28 through May 1, was the back-room hint of 80386-based PCs; Fall Comdex in Las Vegas, Nev., November 10 through 14 should be the unveiling; some may be out by PC Expo in New York City, July 9 through 11.

Forward looking? Still more EGA cards were shown, yet everyone is looking ahead to see what Intel and Texas Instruments, possibly in conjunction with Microsoft and GSS, have in store for more-than-EGA resolution.

Forward looking? From the Spring showing of 720K-byte 3½-inch disk drives in portables to the Fall possibility of a 2-me-

(continued on next page)

New Laser Printers Compete with Canon

PC ANALYSIS

BY JOHN DICKINSON

ATLANTA—Laser printers dominated the hard-copy field at Spring Comdex this year. That shouldn't be much of a surprise, but the lack of new Canon-engine-based products was, Canon's dominance of the field faces serious challenges from

Ricoh, Konica, Kyocera, and NEC.

300-DPI Resolution

The new entries maintain the now-standard 300-dot-per-inch resolution for character formation and/or graphics, and all feature better paper-handling abilities. They have one or two paper-feed bins capable of carrying 250 sheets and collate output in first-page-first order. The

older Canon engine carries 100 sheets of paper and collates in first-page-last order.

Canon does have a modified engine out that contains two 250-sheet paper bins, but it is a tall, bulky-looking machine. The engine is used in the new Hewlett-Packard Laserjet Plus 500, as well as a yet unreleased (although shown at Comdex) QMS model.

Ricoh Engines Abound

Ricoh sported its own user version of the printer, as did Kyocera, and Ricoh had the most engines supplied to other vendors on an original basis.

Konica didn't show a printer of its own and neither did NEC, but NEC representatives were making no secret of the company's plans to have a Spinwriter-compatible version of its page printer (based on ion deposition rather than laser technology) on the market by Fall Comdex.

The Ricoh engine is featured in the long-awaited Quadram QuadLaser, the DEC LK03, Ricoh LP4080, and the AST TurboLaser. Konica's engine is in the Genicom 5010, and Kyocera's is in the Mannesmann Tally MT910d, as well as in the company's own F1010 laser printer.

Comdex

(continued from preceding page)

gabyte 3½-inch standard, possibly led by IBM.

Forward looking? Users seeking more-powerful software have to be looking ahead because there was nothing major shown in the way of software. However, software seems more likely to be released between Comdex shows than hardware.

Meanwhile, there were a half-dozen new, affordable PC AT compatibles and one or two XT compatibles; inexpensive EGA boards; turbo cards to give AT-like speed to the existing PC and PC-XT base; more multi-scanning monitors that can adapt to any new graphics standard; and, of course, more and cheaper mass storage. About the only major or minor player without an AT compatible now announced is Digital Equipment.

A 12-MHz AT Compatible

The new, downsized—and available—286 12 (12 MHz, \$2,695) and 286 10 (10 MHz, \$2,295) from PC's Limited are the current speed horses, with the 10-MHz Datavue Series 30 (using an NEC V-30 or Intel 8086-1 chip) pressing hard. Other AT compatibles:

- The reduced-footprint Televideo TeleCAT-286 with a 14-inch high-resolution monochrome monitor that supports bit-mapped graphics (\$2,995 with a 20-megabyte hard disk).

- The Panasonic Business Partner 286 (8 MHz), with ten expansion slots (\$2,795 to \$2,995 with one or two floppies; hard disks extra).

- The dual-floppy-equipped 8-MHz Sharp PC-7500 (\$2,995).

- The single-drive version of the 8-MHz Sanyo MBC 990 (\$2,595).

- The \$5,045 NEC APC IV, with a 40-megabyte hard disk and a 1.2-megabyte floppy disk drive.

(For details on these and other products, see New on the Market/Comdex, page 53.)

The AT compatibles all have 10 function keys along the left side of their keyboards, while



Among the AT compatibles at Comdex, Sanyo announced a single drive version of its 8-MHz Sanyo MBC 990 (shown above). The single drive unit costs \$2,595.

There were a half-dozen new, affordable PC AT compatibles. About the only major or minor player without an AT compatible now announced is Digital Equipment.

IBM has gone to 12 along the top; some makers are considering changes.

Portable ATs

Toshiba wedged an 8-MHz AT into the 15-pound T3100 portable. AC-powered, it has a 10-megabyte hard disk, a 3½-inch floppy, and a plasma CGA-compatible display for \$4,499.

Quadram showed a 16-pound, battery-operable Datavue PC portable with a 20-megabyte hard disk drive, a 3½-inch floppy, and a "gaslight" screen for \$3,495; a 10-MHz 80286-based AT-compatible version should be available in August in the \$4,000 range.

In the desktop PC competition, the price race is extremely close. Slightly leading is the Magnum XT/Mark 2—with dual floppy disk drives, dual speeds (4.77/8 MHz), and a monochrome monitor with a Hercules-compatible board—at

\$1,495. Close on is the new \$1,295 Panasonic Business Partner, also with dual speeds (4.77/16 MHz), six slots, and one floppy disk drive. (The dual-floppy model is \$1,495; neither model includes a monitor.) Also in contention is the new Kaypro PC (two drives, nine slots, and a 12-inch monochrome graphics monitor) for \$1,595. And promised soon, for \$1,695 (without monitor), is Kaypro's XT compatible, with a 10-megabyte hard disk and single floppy.

A \$269 EGA Card

PC's Limited showed its \$269 EGAs! board, with a 256K-byte bit-mapped graphic buffer, a RAM-loadable character generator, a light-pen interface, and support for monochrome, CGA, and EGA modes. At \$299 is the ATI half-card Small Wonder, which adds 720 by 348 Hercules-compatible monochrome graphics and 132-column color/monochrome capability.

Among the establishment board companies, Tecmar introduced its EGA Master (\$395, including 256K-byte RAM), with 640 by 350, 320 by 200, and 640 by 200 16-color (64-color palette) resolution, togeth-



Just in time for the Atlanta show, NEC Information Systems released the \$5,045 NEC APC IV with a 40-megabyte hard disk and a 1.2-megabyte floppy disk drive.

er with 720 by 350 and 640 by 350 for the IBM monochrome display. AST offered a similar product, with optional parallel printer output, for \$550. The QuadEGA+ (Quadram, \$595) and STB EGA Plus (price reduced to \$495), together with many others introduced at Fall '85 Comdex, were already in the field. These were joined at Comdex by the Sigma Designs SigmaEGA! (\$595) and the \$499 Z-439-A EGA from Zenith Data Systems. *PC Magazine* will feature full PC Magazine Labs reports on EGA-compatible boards in August.

Beyond EGA

Going beyond the ordinary EGA emulation were Orchid's TurboEGA, which turns even *Windows* into a high-speed operating environment (\$945, with 256K bytes, a 7.2-MHz 80286, and an optional 5- or 8-MHz 80287) and the Tseng Labs EVA (Enhanced Video Adapter, \$525; \$575 with optional daughterboard adapter for Hercules/CGA/MGA emulation). Genoa Systems' 9-MHz Super-EGA (\$475; \$525 with optional printer port) is also based on its own proprietary chip set and is designed to provide compatibility with all existing EGA, CGA, and Hercules standards.

Everex put a \$350 EGA piggyback on its new \$249 Enhanced Evergraphics motherboard and will be offering true dual-display capability for \$599 in June. For straight EGA emulation (with 256K-byte RAM), Everex also introduced its \$425 Enhancer board. Introduced at \$1,495, Orchid's new TurboPGA (professional graphics adapter), which will soon support *Windows*, is also a sign of graphics things to come.

If NEC's Multisync monitor (which automatically locks into the output from a CGA, EGA, or the analog PGA card) stole the spotlight at the last show, Sony's Multiscan, with its 900 by 560 resolution and extremely fine pitch, did a similar job in Atlanta. Promised for July, at less than \$1,000, it really made the Orchid TurboPGA demonstration. Available immediately were Princeton Graphics' top

SR-12P analog monitor (640 by 480, .31-millimeter dot pitch) for the PGA (\$999) and its enhanced HX-12E (.28-millimeter pitch, 15.75- or 22-KHz compatible, 16 or 64 colors with CGA or EGA), at \$785. Panasonic introduced three new monitors at \$199 (mono), \$599 (CGA), and \$699 (EGA). Tecmar also debuted its new high-resolution color monitor (720 by 480 4-color; 640 by 400 in 16 colors), priced at \$795. New from Quimax was the PX-32, a new analog monitor compatible with the PGA, offering 720 by 480 resolution and colors ranging from monochrome green (text) to a palette of 4,096 shades. PC's Limited had its own price-smashing EGA monitor at \$479.

Princeton showed a prototype full-page-display high-resolution preview monitor with 8½ by 11 screen, for viewing graphics pages as they will be reproduced by a laser printer. It's not for sale yet; Princeton is seeking third parties to connect its software to it.

Canon showed a \$1,685 image scanner, the XI-12. Others, including Datacopy, DEST, Ricoh, and Vision Research, have also unveiled new hardware and software and have cut the prices on existing models. Crucial to the success of desktop publishing is software that smoothly integrates text and graphics.

Mass Storage, Backup

As the realization has grown that not even Winchester's shoot straight forever, the need for tape (and other forms) of backup has become increasingly apparent. While traditional DC-600 cartridge-based ¼-inch

tape systems continue to have their advocates, pride of space is yielding to the smaller (2.4 by 3.2-inch) DC-2000 ¼-inch tape minicartridges, which can comfortably hold up to 40 megabytes. The largest supplier of drives in this field is Irwin Magnetics, which rounded out

Grasshopper, the TG-1020i (internal, \$995; 1020e external at \$1,295) 20-megabyte backup units that incorporate the new QIC-200 (PCT) error-correcting standard. Also new from Tallgrass were combo units, with 20-megabyte DC-2000s bundled with 25-megabyte hard



Katspro's list of new IBM compatibles offers the Katspro PC. The \$1,595 system comes with two disk drives and a 12-inch monitor.

its 10-, 20-, and 40-megabyte 3½- and 5¼-inch lines. All models are upwardly compatible half-heights, driven by your floppy disk controller, and incorporate Irwin's own error-correcting format. Prices for the new retail models are: \$850 for the model 120 (5¼ inches, 20 megabytes; for the PC and XT); and \$995 for the 145 (5¼ inches, 40 megabytes; AT).

Also new for the DC-2000, in 40-megabyte configurations, are the ADIC TD440 (\$1,490) and a new OEM-only unit from Archive. Tallgrass debuted its

disks (TG-2025i for \$1,995; TG-2025e for \$2,295). And in addition to expanding its PC Plus series to include a 16-user cluster controller and adding Novell compatibility, Alloy said it would make its APT-40 QIC-based DC-2000 backup units available through distributors, though the retail price has not yet been fixed.

New 3½-Inch Standard?

The April 2 introduction of IBM's laptop PC Convertible saw the company's first use of 3½-inch floppy disks, a genre currently formatted at 360K bytes per side. TDK, Maxell, Sony, and Verbatim, however, all announced at the show that they were prepared to produce high-density, 2-megabyte 3½-inch floppy disks. Zenith Data Systems announced that its complete line of desktop PCs was ready to support the high-density 3½-inch floppy disk, just in case someone out there might take a fancy to it in the coming months.



Irwin Magnetics' line of storage and backup units now includes the 20-megabyte Model 125 (left) and the internal 40-megabyte Model 145.

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READ A LOT
WORRY A LOT
AND PAY A LOT.



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APPLICATION DEVELOPMENT		
	R:base 5000	dBASE III* PLUS
Application Generator		
• Multi-table Access	Yes	No
• Nested Menus	Yes	No
• Custom Reports	Yes	No
• Reusable Applications	Yes	No
Password Security		
• Pages of Documentation	11½	36
• Usable by Nontechnical User	Yes	No
Automatic Protection Against "Deadly Embrace"	Yes	No
List Price		
• Single-User	\$ 700	\$ 695
• Multi-User		
5 Users	\$1,500	\$2,385
10 Users	\$1,500	\$3,690
20 Users	\$1,500	\$7,360

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After all, when it comes to developing applications, you can either put yourself through a lot.

Or not.

R:BASE 5000

FROM MICRORIM

IBM Adds Size, Speed, and Print Features to Proprinter XL

PC FIRST LOOK

BY JOHN DICKINSON

Anyone who thinks IBM's product development engineers don't listen to customers ought to take a long look at the company's Proprinter XL. It answers just about every gripe and feature request that *PC Magazine's* editors have heard or made about the original Proprinter.

The IBM printer design team has a reputation for paying attention to the finer details of printer life, such as the Proprinter's unique single-sheet and envelope-loading hopper (included with the XL). IBM's team maintains its reputation with the \$799 Proprinter XL. For starters, the XL features an automatic, electric paper loader that makes the formerly painful job of inserting 14½-inch tractor-feed paper pleasurable.

A Quiet Switch

The XL runs 3 decibels quieter than the original Proprinter; a "quiet switch" that slows it down to 40 characters per sec-

ond in draft mode makes it even quieter. It would be quieter still if IBM added a hatch cover to close the sheet-feed slot when not in use (it acts as a sound amplifier, much like a bass-reflex stereo speaker), but it's a big improvement over the original Proprinter's shriek.

Other new features include a double-high print mode that, especially in near-letter-quality



IBM's \$799 nine-pin Proprinter XL runs at 111 characters per second for draft and 30 cps in near-letter-quality mode. A host of print features missing from the standard Proprinter are accessible from the front panel.

mode, is a stiff competitor for speech-writing fonts in the daisy wheel printer market. The double-high font makes outstanding overhead transparencies when it's combined with double-wide printing.

Front-Panel Controls

Most features (including quiet, double-high, double-wide, and NLQ printing) are accessible through the front panel, as is proportional spacing (another new Proprinter XL feature). The panel is a little difficult to get used to at first, and there's no tactile or auditory feedback (other than a series of faint beeps), but you can use the front panel to set the Proprinter XL in the print mode you need.

The Proprinter XL is rated at 200 cps and 40 cps in quiet mode. It made it through the PC Magazine Labs printer speed test at an effective (throughput) speed of 111 cps in draft mode and 30 cps in NLQ mode. When in quiet mode, it ran at 28 cps in draft and 18 cps in NLQ. By comparison, Epson's \$799 wide-carriage FX-286 claims

PC FACT FILE

Proprinter XL

IBM Information Systems Group
900 King St.
Rye Brook, NY 10573
(800) IBM-2468
List Price: \$799

In Short: The standard Proprinter has been as good as nine-pin dot matrix printers get. The XL adds a wide carriage, faster speed, quieter operation, easy paper loading, and a host of print features accessible from the front panel. Runs at 111 characters per second in draft mode, 30 cps in near-letter-quality mode.

CIRCLE 547 ON READER SERVICE CARD

200 cps draft and 40 cps NLQ but tested at 94 cps and 30 cps, respectively, in PC Magazine Labs. The \$549 standard-carriage Proprinter runs at 91 cps in draft and 30 cps in NLQ.

IBM did well by adding both functionality and features to the Proprinter XL. It's too bad that, at least for now, IBM is not planning to add the same features to its original standard-width Proprinter model. [E]

Library Integrates Word Perfect Line

PC FIRST LOOK

BY CHARLES BERMANT

Satellite Software's *Word Perfect Library* borrows from windowing environments, integrated packages, and desktop memory-resident utilities to create a DOS shell linking the company's product line.

The *Word Perfect Library*, \$129, facilitates the *DESView*-like integration of the SSI line (the *MathPlan* spreadsheet, the SSI *Data* database, both \$195, and the best-selling, \$495 *Word Perfect* word processor) with a series of desktop utilities.

The program is less a *SideKick/Windows* competitor than an effort to develop a *Framework/Symphony*-like integrated environment. However, *The Word Perfect Library* plus the three Satellite Software programs would list for \$1,064, nearly 1½ times the cost of the \$695 Lotus and Ashton-Tate products.

SSI's Strength

But integrated packages frequently fail because of a weakness in one area, most often word processing, where SSI is strongest—that's *The Library's* chance for success.

While *The Library* allows you to switch between applications, it is not a windowing environment. *The Library* contains a calendar, phone dialer, calculator, and macro/program editor. You can go to DOS and run applications not connected to *The Library* and output current memory allocation.

Some features of the utilities are superior to those in *SideKick*. The calendar is more flexible, and the calculator doesn't project a confusing representation of a hand-held model. Although *SideKick* works with *The Word Perfect Library*, *The Library* would be a dubious purchase for anyone already owning the Borland package. *Word Perfect* users who don't have *SideKick* (if that's still possible), though, will soon find *The Library* indispensable. [E]

PC FACT FILE

The Word Perfect Library
Satellite Software International
288 W. Center
Orem, UT 84057
(801) 227-4000
List Price: \$129

Requires: DOS 2.0 or later, 512K recommended with the full integration of three packages.

In Short: A program that integrates the Satellite Software line (*Word Perfect*, *MathPlan*, SSI *Data*), adds a series of desktop utilities, and offers "hooks" for other developers to tie in their spreadsheets or databases for a *Framework*-like package. Not copy protected.

CIRCLE 548 ON READER SERVICE CARD

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tiate file transfers easily and the more experienced to customize transfers to the mainframe environment.

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Many of our customers who already were accustomed to the keyboard of the 3278 felt awkward with the PC keyboard. And vice versa. We responded with the IRMAkey/3270™. It's a keyboard that places



all the 3278 and PC functions together. No matter whether users learned on an IBM PC or 3278, they'll feel comfortable and be more productive with the IRMAkey/3270.

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Five Thesaurus Selections Synonymous with Success

PC FIRST LOOK

BY CHARLES BERMANT

When working with words, these programs can help you make the right choices.

Comedian Steven Wright breaks up his audiences by asking, "What's another word for thesaurus?" If Wright had a personal computer and one of the new thesaurus programs, he could find the answers to his query (*lexicon*, *glossary*, *word list*, and *synonymicon*) all at a keystroke.

Three programs—*Webster's New World On-Line Thesaurus* from Simon & Schuster Software, *Reference Set* from Reference Software, and the latest release of *Word Finder* (Version 3.2) from Writing Consultants—represent the best of the thesaurus software available. In addition, two pieces of software that are not specifically thesaurus programs—Borland International's *Turbo Lightning* and Satellite Software's *Word Perfect*, Version 4.1—have built-in thesaurus features.

All accomplish the same things—and well. There isn't a loser in the bunch. All are intuitive; the commands are obvious and the manuals are not really necessary. All work on floppy disk systems, but they really deserve hard disks.

Memory Resident

None are copy protected, although *Word Finder* puts you through a personalization procedure. Furthermore, all are extremely well behaved. This review was written in *Word Perfect* with all five programs resident in memory, and there were no conflicts or crashes, although the Alt-T command shared by the Reference Soft-

ware and Simon & Schuster packages had to be reconfigured.

This is not to say that the products are the same or that they have no individual identities. Each has a different method of cross-referencing words, if at all, and the menus and pop-up features differ greatly. And while all five are similar and adequate, *Webster's Thesaurus* is somewhat better because of its ability to recognize grammatical subtleties and correct verb tenses.

Both *Reference Set* and *Turbo Lightning* are based on the Random House *Thesaurus*; consequently, you'll get identical word solutions from two very different programs. However, Borland would object to pigeonholing *Turbo Lightning* as only a thesaurus; the company is pushing the program as the heart of an artificial-intelligence-based PC system. It does work as a freestanding thesaurus, and Borland fans anxious for whatever the company has up its sleeve are likely to be satisfied with *Turbo Lightning*. Its disadvantages, such as the way the menu obliterates the screen's top line, are not that awkward.

Assessing Differences

While *Reference Set* has no comparable future, it is more flexible. An optional smaller dictionary allows it to be used on a floppy disk system. The thesaurus can be purchased separately, so less memory is used. But despite the claims of an intense marketing campaign from Reference Software, there seems to be little difference in speed, effectiveness, and ease of use between the two programs.

Turbo Lightning and *Reference Set* include real-time spelling checkers, which neither enhance nor detract from the thesaurus functions. Oddly, aside from *Word Perfect*, all these programs use dictionary reference points in response to

words they don't contain.

Word replacement functions also differ. *Word Finder* has the most effective and well-mannered automatic replacement utility, which is enhanced by a recently expanded word library. In contrast, the procedure that

Reference Set uses is more complicated: while the cursor can be anywhere when you look up a word, *Reference Set* requires that it be at the word's beginning, with the insert key off, for word replacement to work. With this much to remember, it becomes just as easy to type the word in directly.

The memory-resident *Word Perfect* thesaurus is the only one of these products not using a

(continued on page 44)

PC FACT FILE

Webster's New World On-Line Thesaurus

Simon & Schuster Software

1230 Ave. of the Americas

New York, NY 10020

(800) 624-0023

List Price: \$69.95

Requires: 12K RAM, DOS 2.0 or later.

In Short: It has a rich word list and can recognize grammatical subtleties and different word forms. It's a companion to *Webster's New World Spelling Checker*. Not copy protected.

CIRCLE 422 ON READER SERVICE CARD

Reference Set, Version 2.01

Reference Software

2365 Boulevard Circle

Walnut Creek, CA 94595

(800) 826-2222

List Price: \$69. \$89 with spelling checker

Requires: 128K RAM, DOS 2.0 or later

In Short: Shares a word list with Borland's *Turbo Lightning*, although its screen setup is easier to read. Has optional spelling checker. Not copy protected.

CIRCLE 423 ON READER SERVICE CARD

Word Finder, Version 3.2

Writing Consultants

Techniplex Center

300 Main St

East Rochester, NY 14445

(706) 377-0130

List Price: \$79.95

Requires: 29K RAM, DOS 2.0 or later (available for earlier versions by special order).

In Short: It has a rich word list

and the best-behaved replacement utility of all the packages. Will be featured in *MicroPro* and *VolksWriter* products under an original equipment manufacturer agreement. Not copy protected (but requires "personalization procedure").

CIRCLE 424 ON READER SERVICE CARD

Turbo Lightning

Borland International

4585 Scotts Valley Dr.

Scotts Valley, CA 95066

(408) 438-8900

List Price: \$99.95

Requires: 128K RAM, DOS 2.0 or later.

In Short: The engine for the in-progress *Turbo Lightning* system can be used as a free-standing thesaurus. The program also features a real-time spelling checker, and add-ons from Borland are expected. Not copy protected.

CIRCLE 425 ON READER SERVICE CARD

Word Perfect, Version 4.1

Satellite Software International

208 W Center St.

Orem, UT 84057

(801) 224-4000

List Price: \$495

Requires: 256K RAM, DOS 2.0 or later.

In Short: The thesaurus works within *Word Perfect* and is not available as a separate product, but it is as capable as current add-on products. Purchasers of *Word Perfect* will have no need to upgrade their thesaurus capabilities. Not copy protected.

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DATABASE SYSTEMS

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 6390. dBase III+
BORLAND
 65. dBase
 578. RBase 5000
KANTUCKET
 558. Clipper

WORD PROCESSING

- DAC**
 38. Easy Word
LIVING VIDEOTEXT
 59. Ready
 108. Think Tank
MICROSOFT
 245. Word
MICROPRO
 85. Easy
 178. WordStar 3.3
 249. WordStar Professional
 285. WordStar 2000+
MULTIMATE
 65. Just Write
 228. Multimate
 245. Executive
 288. Advantage
 SSI (Satellite)
 325. WordPerfect 4.1

SPREADSHEETS

- LOTUS**
 6395. 1-2-3
MICROSOFT
 124. Multiplan
PAPERBACK
 65. VP Planner

INTEGRATED PACKAGES

- ASHTON-TATE**
 6415. Frameword II
LOTUS
 458. Symphony
MICROSOFT
 65. Windows
SOFTWARE PUBLISHING
 57. Print
 74. Report
 64. File, Write, Graph, Access or Plan
QUARTERDECK
 65. Desktop

GRAPHICS

- DECISION RESOURCES**
 1155. Sign Master
 209. Diagram Master
 235. Chartmaster
 245. Map Master
GRAPHICS COMMUNICATION
 215. Freelance
 539. Graphwriter Combo
MICROGRAFX
 109. Draw
 115. Windows Draw (Req Windows)
 229. PC Draw
 275. In-A-Vision
MICROSOFT
 189. Chart

ORDERING INFORMATION

- Mail to: 12060 SW Garden Place, Portland, OR 97223
- We also carry products for the Apple II series and Macintosh
- Most orders shipped Federal Express Standard Air
- Shipping Charges:
 - US and Puerto Rico add 3% (85 minimum)
 - Canada add 12% (85 minimum)
 - Foreign add 18% (255 minimum)
 - APO, FPO and other US Territories add 6% (110 minimum)
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■ PC UPDATE ■ CHRIS BARR

IBM sold its 84 IBM Product Centers to NYNEX, which will rename them (and its existing Datago stores) the NYNEX Business Centers. The ex-IBM stores will add Apple, Compaq, and AT&T personal computers, peripherals, 3Com networks, and cellular telephones. NYNEX gets the stores, the inventory, IBM dealership agreements (frozen recently), and access to IBM customer lists but not the IBM Product Center logo. Why did IBM sell the stores? While it gained valuable retail experience by maintaining the Cen-

ters, Big Blue was handicapped by its policies of selling at list price, offering only a handful of non-IBM add-ons and not fielding a direct sales force.

Still more IBM competitors are responding to IBM's reductions of up to 26 percent on PC-XTs and 12 percent on PC ATs. Kaypro, NCR, Wang, AT&T, and ITT cut prices 6 to 37 percent. Now, almost all makers (except Tandy and NEC) have lowered prices in the wake of IBM's April 2 announcement. Biggest reductions—on machines equipped with hard disk drives—were made to keep customers from buying a basic floppy-disk machine and outfitting it with a cheaper third-party hard disk drive.

Reflex, the Borland International database, was raised to \$149.95, from \$99.95, on May 15. Borland also says it is publishing the file format specifications so users can create utilities for *Reflex* files or use *Reflex* with 1-2-3 or dBASE. Prior to Borland's acquisition of Analytica Corp last year, *Reflex*'s developer, the program was \$495.

Great Plains Software Inc. of Fargo, N. Dak., has announced *The Great Plains Accounting Series*, an enhanced version of its *Hardisk Accounting Series*. The new package incorporates *Btrieve*, the proprietary file-management system from the Austin, Tex.-based Softcraft Inc. The accounting system includes more than 170 enhancements and new modules, such as the Network Manager for LANs and the Report Maker Plus, which has a database manager for customizing reports to user specifications. The ten modules are geared toward small- and medium-size businesses and sell at either \$695 or \$395 for each. *Btrieve* costs \$245; *Btrieve/N*, the network/multiuser version, is \$595. For more information, contact Great Plains Software Inc., 1701 SW 38th St., Fargo, ND 58103; (701) 281-0550.

Cambridge Software Collaborative added features and cut the price of its *Cambridge Spreadsheet Analyst*, Version 2.0. Six new reports are available, and the price has dropped from \$149 to \$89.95. The first in a series of add-ons is the *Macro Analysis Module* (\$49.95), which documents macro commands in a spreadsheet. Registered owners of the earlier version will receive an upgrade and a copy of the module for free.

PRICE REDUCTIONS

Company	Model	Old price	New price	Price cut
IBM	PC	\$2,295	\$1,995	13%
	PC-XT	\$3,895	\$2,895	26%
	PC AT	\$5,995	\$5,295	12%
Compaq	Portable 286	\$6,999	\$6,199	11%
	Deskpro 286	\$6,699	\$5,699	15%
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	Z-158	\$3,699	\$2,799	24%
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ITT	Xtra XP	\$4,965	\$3,495	30%
Kaypro	286i Model A	\$2,995	\$2,495	17%
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	PC6	\$5,154	\$3,690	28%
Wang	PC-S3-2	\$3,615	\$2,440	33%
	XAPC-S2	\$5,495	\$4,990	9%
AT&T	PC 6300 (10 Mbytes)	\$4,420	\$3,220	27%
	6300 PLUS (20 Mbytes)	\$6,320	\$5,420	14%

Thesaurus

(continued from page 42)

pop-up window to highlight the word selection; instead, the lower half of the screen is replaced by a synonym chart.

Word Lists and Add-Ons

Unfortunately, the word list shared by *Reference Set* and *Turbo Lightning* is not as complete as those in the other packages. For example, both had no synonyms for *identical*, while the others offered *duplicate*, *interchangeable*, and *analogous*.

Word Perfect's word list is better than that of the Random House-based programs but not quite as complete as those in

Word Finder or *Webster's Thesaurus*. However, *Word Perfect*'s thesaurus places it a cut above other full-featured word processors, and purchasers of *Word Perfect* will have no compelling need for add-on thesaurus packages.

The add-ons, however, are targeted toward users who want to upgrade word processors already in use. Of the group reviewed, *Webster's Thesaurus* is the best. It has the strongest, most thorough word list. The manual features a series of appendixes that serve as succinct, effective usage tools. The package is a first course in how to improve your writing for just \$69.95.



After a thesaurus program is loaded into memory, the word list can be called up with a command, such as Alt-T. Here, Webster's New World On-Line Thesaurus takes the original word, finds the proper root word, and cross-references it to another term.

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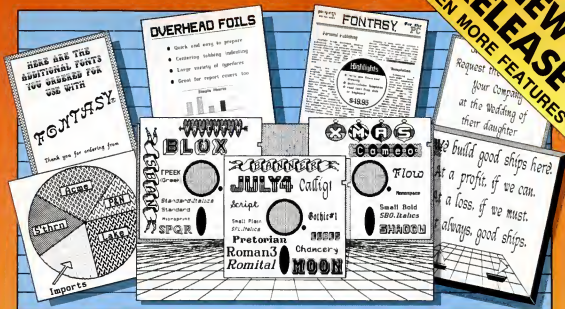
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MSP-20	329
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Premare 35 Dataswheel	415
EPSON - Call on all models	
JUKI	
Juki 6100	349
Juki 6300	665
8850	
PS Parallel	995
PS XL	1149
Eli 360	398
OKICATA - Call on all models	
PANASONIC	
1091	235
1092	299
1592	435
KXP3151	410
STAR MICRONICS - Call for prices	
TOSHIBA	
P331	975
P341	799

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AMDEK	Call for price
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■ NEW ON THE MARKET/COMDEX ■ PAUL M. STAFFORD

EGA CARDS: PC's Limited, Genoa, Tecmar, Orchid, Zenith Data Systems

Five manufacturers jumped on the Enhanced Graphics Adapter bandwagon in Atlanta:

PC's Limited staked out the price point with its EGAdsl. EGAdsl comes fully loaded with 256K bytes of graphics memory, and at \$269 it is \$30 less than the PC Designs EGA.

Genoa Systems \$475 Super-EGA is a half-sized EGA that includes 256K bytes of graphics memory and is compatible with IBM's EGA and CGA standards, as well as with the Hercules monochrome graphics mode. The Super-EGA+, at

\$625, also includes a clock/calendar and parallel and serial ports. Both cards use Genoa's proprietary chip set and BIOS.

Tecmar's \$395 EGA Master is built around the Chips and Technologies EGA chip set. An optional serial port is available for \$50.

For \$945, Orchid Technology's TurboEGA includes an EGA with the full 256K-byte complement of memory plus an 8-MHz 80286 coprocessor—an ingenious way to handle the slower speed of PCs and XT's running EGA applications.

Zenith Data Systems' Z-439-A features 256K bytes of video memory and lists at \$499.

List Price: EGAdsl, \$269. **PC's Limited**, 1611 Headway Circle, Bldg. 3, Austin, TX 78544; (512) 339-6800.

CIRCLE 428 ON READER SERVICE CARD

List Price: Super-EGA, \$475; optional parallel port, \$50; Super-EGA+, \$625. **Genoa Systems Corp.**, 73 E. Trimble Rd., San Jose, CA 95131; (408) 945-9720.

CIRCLE 429 ON READER SERVICE CARD

List Price: EGA Master, \$395. **Tecmar Inc.**, 6225 Cochran Rd., Solon, OH 44139-3377; (216) 349-0600.

CIRCLE 430 ON READER SERVICE CARD

List Price: Z-439-A, \$499. **Zenith Data Systems Corp.**, 1000 Milwaukee Ave., Glenview, IL 60025; (800) 842-9000, ext. 1.

CIRCLE 431 ON READER SERVICE CARD

List Price: TurboEGA, \$945. **Orchid Technology Inc.**, 47790 Westinghouse Dr., Fremont, CA 94539; (415) 490-8586.

CIRCLE 432 ON READER SERVICE CARD

PC-XT COMPATIBLES:

Kaypro, Olivetti, Panasonic, Datavue

Four vendors—Kaypro, Olivetti, Panasonic, and Datavue—introduced PC-XT-compatible machines at the show. None emulated IBM's recent keyboard enhancements.

Kaypro featured two entries.

INK JET PRINTER: Diconix 150 Weighs 4 Pounds, Emulates Proprietary, FX

Following recent advances in the laptop PC market, Diconix, a division of Kodak, has introduced a 4-pound ink jet printer that should make DOS-to-go applications even more functional. The \$479 Diconix 150 runs on C batteries or 120-volt current and emulates IBM's Proprietary and Epson's FX series. It features a replaceable printhead, prints on both regular and ink jet paper, and measured 68 character-per-second draft and 29 cps emphasized on PC Magazine Labs benchmark tests.

List Price: Diconix 150, \$479; printheads, \$9.95. **Diconix Inc.**, 3100 Research Blvd., Dayton, OH 45420; (513) 259-3100.

CIRCLE 466 ON READER SERVICE CARD



Diconix's \$479 Diconix 150 ink jet printer weighs less than 4 pounds and emulates IBM Proprietary and Epson FX series print commands.

Photograph: Toshiba T3100, Thom O'Connor

HOT PROSPECT**Toshiba T3100: AT Power Packed in 15-Pound Laptop**

Cross a PC AT with a laptop portable and you get Toshiba's T3100—a 15-pound, \$4,499 machine with an 8-MHz 80286 processor, 640-by-400-line gas plasma display, and 10-megabyte hard disk drive.

The T3100 measures two to eight times as fast as a standard IBM PC on PC Magazine Labs processor speed benchmark tests—about equal to Compaq's 80286-based Portable II. However, its shock-mountable 3½-inch hard disk drive has a slow 156-millisecond access time (an AT rates 40; a PC-XT, 85 to 110 milliseconds). Also standard is a 3½-inch, 720K-byte floppy disk drive.

Measuring 12.2 inches wide by 3.1 inches high by 14.2 inches deep, the T3100 runs only on 110/220-volt external power. The display is compatible with IBM's 640 by 200 CGA standard, reproducing each line twice to achieve 640 by 400 resolution.

The T3100 includes 640K bytes of RAM, parallel and serial ports, an RGB



Toshiba's \$4,499 T3100 packs performance equal to a Compaq Portable II's into one-third the volume. The T3100 includes 640K bytes of RAM, a 10-megabyte hard disk drive, a 3½-inch floppy, and a gas plasma display.

color monitor, and external 5¼-inch floppy disk drive connections. Optional are a 300/1200-bit-per-second Hayes-compatible internal modem and a 1-megabyte memory expansion board.

List Price: T3100, \$4,499. **Toshiba America Inc.**, Information Systems Div., 2441 Michelle Dr., Tustin, CA 92680; (714) 730-5000.

CIRCLE 427 ON READER SERVICE CARD

LASER PRINTERS: Oasys, QMS, Ricoh, Kyocera, CIE

Five major players in the printer market introduced laser printers at Spring Comdex.

Oasys Automation Systems' debutante was the LaserPro Express. Printing at 8 pages per minute (ppm), the \$1,895 LaserPro Express features ten resident fonts and 384K RAM.

QMS rolled out the QMS Big Kiss, an addition to the QMS Kiss family of lasers. The \$2,995 Big Kiss offers 17 resident fonts and 640K RAM; it prints at 8 ppm.

Ricoh stepped into the retail market with its \$3,495 LP4080R, which features 220K bytes of memory and four built-in fonts.

Kyocera International's Comdex entry was the F-1010 Compact Laser Printer, a



QMS's \$2,995 Big Kiss is an 8-page-per-minute laser printer that offers 640K bytes of print memory and 17 resident fonts.



Panasonic's \$1,295 Business Partner XT compatible runs at dual clock speeds of 4.77 and 7.16 MHz.

The Kaypro PC, at \$1,595, comes with 256K bytes of RAM, serial and parallel ports, two floppy drives, a color/monochrome graphics controller, and a monochrome monitor. The Kaypro XT includes a single floppy disk drive and comes without video controller or monitor; it lists for \$1,695. Both machines feature a long list of bundled software.

Olivetti announced its \$1,900 M19, whose standard equipment includes 512K RAM

and one floppy disk drive.

Panasonic rolled out its first PC-compatible desktop, the \$1,295 Business Partner. Its 8086-2 CPU runs at dual speeds of 4.77 and 7.16 MHz. The Business Partner also includes 256K RAM on a 640K-byte motherboard and one floppy disk drive. An additional floppy disk drive is available for \$200.

Datavue Technical Systems' Series 30 PC is powered by a proprietary Datavue 8612 CPU, which includes either an Intel 8086-1 or NEC V30 microprocessor running at 10 MHz. The base system includes one 360K-byte floppy disk drive and retails for \$1,295.

List Price: Kaypro PC, \$1,595; Kaypro XT, \$1,695. Kaypro Corp., 533 Stevens Ave., Solana Beach, CA 92014; (619) 481-4300.

CIRCLE 445 ON READER SERVICE CARD

List Price: M19, \$1,900. Olivetti USA, 765 U.S. Hwy. 202, Somerville, NJ 08876; (201) 526-8200.

CIRCLE 446 ON READER SERVICE CARD

List Price: Business Partner, \$1,295. Panasonic Industrial Co., One Panasonic Way, Secaucus, NJ 07094; (201) 348-7000.

CIRCLE 447 ON READER SERVICE CARD

List Price: Datavue Series 30 PC, \$1,295. Datavue Technical Systems Inc., 4355 International Blvd., Norcross, GA 30093; (404) 564-5780.

CIRCLE 448 ON READER SERVICE CARD

IMPACT PRINTERS: Genicom, NEC, Juki, Silver-Reed, Star Micros, C. Itoh

Manufacturers of impact-printers went on a roll at Comdex.

Genicom introduced its 80-column Genicom Model 1025 and 136-column Genicom Model 1020 dot matrix printers. Listed at \$699 and \$899, the Genicom 1000-series printers both claim speeds of 200 characters per second in draft mode and 100 cps in near-letter-quality mode, while PC Magazine Labs benchmark tests gave actual speeds of 119-cps draft and 75-cps NLQ. Features include

(continued on next page)

AT COMPATIBLES: Sharp, Televideo, Sanyo, Panasonic, Olivetti, NEC, PC's Limited

AT-class computers were all the rage at Comdex as six vendors unleashed 80286-based machines. None emulated IBM's recent keyboard enhancements, such as the added function keys and the placement of the function keys across the top of the keyboard.

Sharp announced its PC-7500. At \$2,995, the PC-7500 includes 512K bytes of RAM, keyboard-selectable 6- or 8-MHz clock speeds, MS-DOS 3.1, and GWBASIC.

Televideo Systems offers the TeleCAT-286, a downsized version of its \$3,395 Televideo AT. At \$2,995 for a 20-megabyte unit, the TeleCAT-286 features 512K RAM, an 8-MHz clock speed, monochrome graphics card and monitor, and MS-DOS 3.1. Its 16- by 16½-inch footprint is 28 percent smaller than that of the IBM PC AT.

Sanyo's \$2,599 MBC-990 features selectable 6- and 8-MHz clock speeds, 512K RAM, a 1.2-megabyte floppy disk drive, and a 200-watt power supply.

Panasonic's Business Partner 286 comes with a 1.2-megabyte floppy disk drive, 512K RAM, MS-DOS 3.1, and GWBASIC and costs \$2,795. An additional 360K floppy disk drive is available for \$200 more.

Olivetti unveiled its \$5,500 M28, which features 512K RAM and a 20-megabyte hard disk.

NEC introduced its Advanced Personal Computer IV (APC IV). The \$5,045 base unit will include 640K RAM, MS-DOS 3.1, and GWBASIC. It will also come with a 1.2-megabyte floppy disk drive and a 40-megabyte hard disk.

PC's Limited's \$2,295 286 10 and \$2,695 286 12 run at 10- and 12-MHz clock speeds, respectively, and both can be switched to 6 MHz where compatibility with the higher speeds presents problems. Unlike pre-



Televideo's \$2,995 TeleCAT-286 AT compatible includes a 20-megabyte hard disk and 512K bytes of RAM; it has a 28 percent smaller footprint than the IBM PC AT.

vious PC's Limited offerings, the 286 10 and 286 12 include proprietary motherboards and ROMs created by PC's Limited. **List Price:** Sharp PC-7500, \$2,995. Sharp Electronics Corp., Sharp Plaza, Mahwah, NJ 07430; (201) 529-8200.

CIRCLE 438 ON READER SERVICE CARD

List Price: TeleCAT-286, \$2,995. Televideo Systems Inc., 1170 Morse Ave., Sunnyvale, CA 94086; (408) 745-7760.

CIRCLE 439 ON READER SERVICE CARD

List Price: MBC-990, \$2,599. Sanyo Business Systems Corp., 51 Joseph St., Moonachie, NJ 07074; (201) 440-9300.

CIRCLE 440 ON READER SERVICE CARD

List Price: Business Partner 286, \$2,795. Panasonic Industrial Co., One Panasonic Way, Secaucus, NJ 07094; (201) 384-7000.

CIRCLE 441 ON READER SERVICE CARD

List Price: M28, \$5,500. Olivetti USA, 765 U.S. Hwy. 202, Somerville, NJ 08876; (201) 526-8200.

CIRCLE 442 ON READER SERVICE CARD

List Price: Advanced Personal Computer IV, \$5,045. NEC Information Systems Inc., 1414 Massachusetts Ave., Boxborough, MA 01719; (617) 264-8000.

CIRCLE 443 ON READER SERVICE CARD

List Price: 286 10, \$2,295; 286 12, \$2,695. PC's Limited, 1611 Highway Circle, Bldg. 3, Austin, TX 78544; (512) 339-6800.

CIRCLE 444 ON READER SERVICE CARD

\$3,500 unit featuring 51 resident fonts, 1 megabyte of memory, and a 10-ppm print speed.

CIE Systems' \$3,495 LIPS 10 prints at 10 ppm and claims a life cycle of 600,000 pages.

List Price: LaserPro Express, \$1,895. Oasys Office Automation Systems Inc., 8352 Clairemont Mesa Blvd., San Diego, CA 92111; (619) 576-9500.

CIRCLE 433 ON READER SERVICE CARD

List Price: QMS Big Kiss, \$2,995. QMS Inc., P.O. Box 81250, Mobile, AL 36689; (205) 633-4300.

CIRCLE 434 ON READER SERVICE CARD

List Price: LP4080R, \$3,495. Ricoh Corp., 5 Dedrick Pl., West Caldwell, NJ 07006; (201) 882-2000.

CIRCLE 435 ON READER SERVICE CARD

List Price: F-1010 Computer Laser Printer, \$3,500. Kyocera International Inc., 8611 Balboa Ave., San Diego, CA 92123; (800) 367-7437; (619) 576-2600.

CIRCLE 436 ON READER SERVICE CARD

List Price: LIPS 10, \$3,495. CIE Systems Inc., 2515 McCabe Way, Irvine, CA 92713; (714) 660-1421.

CIRCLE 437 ON READER SERVICE CARD

New on the Market

(continued from preceding page)

18-pin printheads, optional plug-in personality cartridges at \$85 apiece, and font cartridges for \$35 apiece.

NEC announced two 24-pin dot matrix color printers: the \$849 80-column CP6 Color Pinwriter and the 136-column \$1,049 CP7 Color Pinwriter. Both print in seven colors plus black and are rated at 216-cps draft, 180-cps NLQ, and 65-cps letter quality.

Juki Office Machine's \$1,395 6500 daisy wheel printer has a claimed speed of 60 cps.

Silver-Reed's \$299.95 EXP420 daisy wheel printer boasts an automatic dual-bin cut-sheet feeder and a claimed print speed of 12 cps.

Star Micronics introduced its NL-10 9-pin dot matrix printer. At \$319 plus \$60 for an IBM PC interface cartridge, the NL-10 operates at a claimed speed of 120-cps draft, 30-cps NLQ.

C. Itoh Digital Products' \$819 Prowriter C-315 is a wide-carriage dot matrix that runs at claimed speeds of 300 cps in draft mode, 50 cps in NLQ mode, and 33 cps in letter quality mode.

List Price: Genicom Model 1025, \$699; Genicom Model 1020, \$899; personality cartridges, \$85; font

cartridges, \$35. Genicom Corp., Waynesboro, VA 22980; (703) 949-1188.

CIRCLE 448 ON READER SERVICE CARD

List Price: CP6 Color Pinwriter, \$849; CP7 Color Pinwriter, \$1,049. NEC Information Systems Inc., 1414 Massachusetts Ave., Boxborough, MA 01719; (617) 264-8000.

CIRCLE 450 ON READER SERVICE CARD

List Price: Juki 6500, \$1,395. Juki Office Machine Corp., Printer Div., 20437 S. Western Ave., Torrance, CA 90501; (800) 325-6314, in Calif.; (800) 435-8586.

CIRCLE 451 ON READER SERVICE CARD

List Price: EXP420, \$299.95. Silver-Reed America Inc., 19600 S. Vermont Ave., Torrance, CA 90502; (213) 516-7008.

CIRCLE 452 ON READER SERVICE CARD

List Price: NL-10, \$319; PC interface cartridge, \$60. Star Micronics Inc., 200 Park Ave., #3510, New York, NY 10166; (212) 986-6770.

CIRCLE 453 ON READER SERVICE CARD

List Price: Prowriter C-315, \$819. C. Itoh Digital Products Inc., 19750 S. Vermont Ave., #220, Torrance, CA 90502; (213) 327-2110.

CIRCLE 454 ON READER SERVICE CARD

MASS STORAGE: Iomega, Priam, Sysgen, Verbatim, Western Digital, Everex

Makers of hard disk drives were active at Comdex as six big names introduced products.

Iomega's \$5,840 Bernoulli Box Plus combines two 20-megabyte Bernoulli Box cartridge drives with an 80-megabyte Winchester drive.

Priam's \$2,698 ID100-PC is a 100-megabyte internal drive

for the PC and XT. Controller card, cables, and utility software are included.

Sysgen introduced a controller card and hard disk series that it says brings AT-class hard disk performance to PCs and XT. The \$250 SC6000 Turbo Controller, when combined with Sysgen's \$1,795 (40-megabyte) or \$2,995 (70-megabyte) Matched Pair internal hard disk drives or any other high-performance hard disks, yields a

MONITORS: Tecmar, Taxan, C.Itoh, Thomson, Tatung

Four manufacturers issued display monitors in various shapes and sizes at Comdex.

Tecmar introduced its \$795 Color Monitor. Producing 720-by-480-pixel resolution in four-color mode and 640-by-400-pixel resolution in 16-color mode, the 13-inch Color Monitor is designed to work with Tecmar's Graphics Master display card and is also compatible with IBM's CGA standard.

Taxan's \$795 13-inch EGA-compatible display is compatible with IBM's EGA standard.

C. Itoh Digital Products debuted its \$799 Chroma Pro CM 4000, compatible with both IBM's CGA and EGA standards.

Thomson's \$239 VM3801-DA/DG, a 15-inch green or amber (\$249) display, automatically adapts signals from a standard color/graphics card into shades of green or amber.

Tatung's \$249 (\$269 amber) MM-1422 is a 14-inch monochrome display directed at CAD/CAM markets.

List Price: Color Monitor, \$795. Tecmar Inc., 6225 Cochran Rd., Solon, OH 44139-3377; (216) 349-0600.

CIRCLE 461 ON READER SERVICE CARD

List Price: Taxan, \$795. Taxan Corp., 18005 Courtney Ct., P.O. Box 8698, City of Industry, CA 91748; (818) 810-1291.

CIRCLE 462 ON READER SERVICE CARD

List Price: Chroma Pro CM 4000, \$799. C. Itoh Digital Products, Inc., 19750 S. Vermont Ave., #220, Torrance, CA 90502; (213) 327-2110.

CIRCLE 463 ON READER SERVICE CARD

List Price: VM3801-DA/DG, \$239 (green); \$249 (amber). Thomson Consumer Products Corp., 5731 W. Shiloh Ave., #111, Culver City, CA 90230; (213) 568-1002.

CIRCLE 464 ON READER SERVICE CARD

List Price: MM-1422, \$249 (green); \$269 (amber). Tatung Co. of America Inc., Video Display Div., 2850 El Presidio St., Long Beach, CA 90810; (213) 637-2105.

CIRCLE 465 ON READER SERVICE CARD

claimed average access time of 28 milliseconds.

Verbatim's 20- and 30-megabyte DataLife DataBank hard disk cards list for \$1,195 and \$1,495, respectively. Each draws 13 watts from the PC's power supply and has claimed average access times of 78 milliseconds.

Western Digital's FileCard20 20-megabyte hard disk card lists at \$895 and comes with a 1-year warranty.

Everex Systems' \$299 EV-390 controller board can control one or two hard disk drives and up to four floppy disk drives, either internally or externally.

List Price: Bernoulli Box Plus, \$5,840. Iomega Corp., 1821 W. 4000 South, Roy, UT 84067; (801) 778-1000.

CIRCLE 466 ON READER SERVICE CARD

List Price: ID100-PC, \$2,698. Priam Inc., 70 W. Montague Expy., San Jose, CA 95134-2085; (408) 946-4600.

CIRCLE 468 ON READER SERVICE CARD

List Price: SC6000 Turbo Controller, \$250; 40-megabyte Matched Pair, \$1,795; 70-megabyte Matched Pair, \$2,995. Sysgen Inc., 47853 Warm Springs Blvd., Fremont, CA 94539; (415) 490-6770.

CIRCLE 467 ON READER SERVICE CARD

List Price: 20-megabyte DataLife DataBank, \$1,195; 30-megabyte DataLife DataBank, \$1,495. Verbatim Corp., 323 Sequel Way, Sunnyvale, CA 94086; (408) 245-4400.

CIRCLE 469 ON READER SERVICE CARD

List Price: FileCard20, \$895. Western Digital Enhanced Peripherals Div., 2445 McCube Way, Irvine, CA 92714; (714) 863-0102.

CIRCLE 469 ON READER SERVICE CARD

List Price: EV-390, \$299. Everex Systems Inc., 48431 Milmont Dr., Fremont, CA 94539; (415) 498-1111.

CIRCLE 470 ON READER SERVICE CARD



Western Digital's \$895 FileCard20 is a 20-megabyte hard disk controller card that fits into 160 slots in a PC or XT.

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TECH PC/AT DESKTOP\$1699

Options:

Tech PC/AT with 20MB Hard Disk ...\$2099

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■ COMMUNIQUE ■ EDITED BY BILL HOWARD

Highlights and lowlights of
Spring Comdex 1986 in Atlanta:

Best Free Entertainment

- The Temptations (sponsored by Digital Communications Associates)
- Barbara Mandrell (Quadrant/Intelligent Systems)
- Ramsey Lewis (NEC)
- Braves-Mets game (Hattori-Seiko)



Intelligent Systems sponsored a concert by Barbara Mandrell, as well as a Christian prayer breakfast with former astronaut Wally Schirra.

They're Offering It Or Demanding It?

A three-word billboard outside the Georgia World Congress Center: "Leadership. Loyalty. Lotus."

Best (and Worst) Buttons



Jerry Schneider of the Capital PC Users Group handed out samples of the show's most popular button.

"[No] Copy Protection," Capital PC Users Group. (For a button, send a stamped, self-addressed envelope with 39 cents postage to the group at 4520 East-West Hwy., #550, Bethesda, MD 20814.)

"Killer EGA," Quadram.
"I've Been Super Twisted," Quadram Datavue's increased-contrast screen technology.
"The IBM Convertible. Solving the Mystery of 'What-ever Happened to the PCjr Team?'," Quadram again.
"Smile If You've Done It Si-

multaneously," AT&T for Simul-Task, a UNIX operating system that runs DOS.

"Firm Up Your Floppy," Distributed Processing Technology, maker of disk controllers.

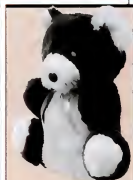
Best Show Announcements

- Toshiba's T300—the laptop IBM should have built instead of the PC Convertible.
- Sayett's (Kodak) innovative overhead projection attachment for CGA graphics output.
- John Dvorak signing to write for PC Magazine.

Every Child a Wanted Child

Intelligent Systems (Quadram's parent) CEO Leland Strange introducing Barbara Mandrell and explaining why she didn't sing at Comdex last year after being in a car crash:

"She had her accident and then had a child."



Favorite Giveaways

Stuffed animals from TeleVideo (tiger) and Distribution Plus (teddy bear).



Array's Half-Card Teams Video Options

PC FIRST LOOK

BY GLENN HART

The ATI Graphics Solution is a low-cost video adapter that provides unusual flexibility. It functions as a monochrome adapter with Hercules-compatible monochrome graphics and can run color programs with 16 shades of gray on an IBM monochrome monitor.

With a color monitor, the ATI Graphics Solution operates as either a standard CGA-type color adapter or as a Plantronics-compatible adapter. The Plantronics mode delivers 16 colors in 320 by 200 resolution or four colors at 640 by 200 (twice the colors provided by a

CGA). It also has a 16-color high-resolution mode and can produce 132-column text on either a monochrome or color monitor. Expansion options can add a parallel port, both parallel and serial ports, or a software protection module.

The card is configured with an eight-position DIP switch lo-



The \$299 ATI Graphics Solution half-card video adapter uses a custom VLSI chip (close to matchbook-size, left).

cated at the top rear of the board. You can change video modes with a supplied program that can remain memory resident, and all the available modes can be selected via the software. Only one nine-pin connector is supplied.

No Color Flicker

PC Magazine Labs tested all the board's operating modes with various software packages. Everything worked as expected. Color flicker was nowhere to be seen. The 132-column monochrome mode can be used with either 25 or 44 lines of text and is really helpful for spreadsheet or table work. ATI doesn't provide any special drivers, though, so you'll have to adapt your software or find custom drivers. 132 by 25 mode in color obviously isn't as sharp, but it's usable on a good monitor.

The solid construction and performance of the ATI Graph-

PC FACT FILE

ATI Graphics Solution
Array Technologies Inc.

450 Esna Park Dr.
Markham, Ontario
Canada L3R 1H5

(416) 477-8804

List Price: \$299; parallel port, \$49; parallel/serial ports, \$79.

In Short: A flexible half-card video adapter with graphics capability in both monochrome and color, including the features of the IBM CGA, Hercules, Paradise Modular Graphics, and Plantronics Color Plus cards. Doesn't emulate IBM EGA, however.

CIRCLE 421 ON READER SERVICE CARD

ics Solution is impressive, especially at its low price. The only thing missing is the Enhanced Graphics Adapter mode.

No other video adapter revs up as much software, drives as many monitors, or fine tunes as many graphics.

STB Systems has just combined the technology of the industry's five most popular video display adapters: the IBM Color Graphics and Monochrome/Printer Adapters, the Hercules Graphics Card™, the Tseng UltraPAK-S™, and the STB Chauffeur™.

With the new Chauffeur HT™, the world's best graphics capabilities are at your service.

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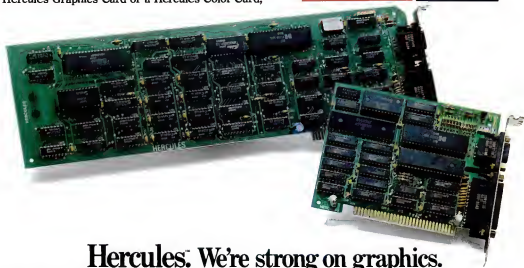
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■ FROM THE EDITOR'S SCREEN ■ BILL MACHRONE

THE 80386: THE MORE THINGS CHANGE . . .

Intel's new 80386 microprocessor promises machines of incredible power. The question is, how far beyond today's DOS-based machines will the industry take it?



The 80386 is a revolution that measures about 1½ inches on a side, but its effects are farther-reaching than its diminutive size would suggest. It outpaces just about everything in sight, even medium-scale minicomputers. It answers hardware designers' prayers. The 80386 has the built-in power to significantly change the way we do personal computing. But how long will it take?

We'll see the first 80386-based machines late this summer. Just as the 80286 has been nothing more than a faster 8088, the early 386 machines will run plain-Jane MS-DOS two to three times faster than existing 80286 machines do. That's great for the power users and the spreadsheet junkies, but it doesn't even begin to tap the enormous power of the 386.

To do that, we'll need new operating system software. Right now, the world is waiting for a new version of DOS from Microsoft. Unfortunately, the next version of DOS won't tap the 386's resources. Microsoft is also working on a 386 DOS, but that's due out much later.

Why, you may ask, do you need more than multitasking on a fast 80286? Maybe you don't. But the 80286 is a quirky, poorly designed chip. For example, you can't switch from protected mode to real mode without resetting the chip and forcing phony addresses into its registers. Like adolescence, it's something to be endured, not dwelt upon. The 386, by contrast, is an adult chip with mature features.

Speed considerations aside, the 386's biggest attraction is its ability to manage multiple 8086 tasks in virtual memory.

This means you can run as many copies of MS-DOS as you want while the 386 convinces each task that it has a full 640K of memory (more, if you want it).

THE WINDOWS CAMP The future according to Microsoft would have us using an 80386 version of DOS in a *Windows*-derived graphical environment. Most of today's applications would have to be rewritten to use the graphical interface and multitasking. To this end, Microsoft has released *Windows*, its idea of the user interface for the future. The plan is to get applications software companies to sign up with *Windows* now, with its user interface, intertask communications, and I/O driver capabilities as a template for future applications under 286 DOS and 386 DOS.

This approach makes sense; many software companies are either evaluating *Windows* versions of their products or have *Windows* applications in development.

Another attraction is the relative ease of porting Macintosh applications to the PC under *Windows*.

THE MULTITASKING CAMP Some designers have a different view of the role of the operating system. While they admit that a consistent graphical user interface is a good thing, they are much more interested in multitasking existing applications rather than reinventing them.

The 80386 is ideally equipped to do this in its "virtual 86" mode. Imagine a *Top-View*-like program interface that allows you to install existing applications software. It gives each a full MS-DOS environment without the speed constraints that today's multitasking applications must deal with. It can offer intertask communications, integrating existing, familiar applications. It can divert direct screen updates into virtual memory and window the applications onto the screen as you would like to see them. Memory-resident convenience programs can go away. Each can have its own copy of MS-DOS.

The 80386 is designed to be an ideal virtual machine, swapping tasks in and out of memory as required. It's designed to use cache memory effectively, the faster the better. To this end, don't be surprised to see two kinds of memory in the upcoming 386 machines: Megabit dynamic RAMs will handle the day-to-day memory tasks. Four megabytes on the motherboard will be common. But the 386's internal memory management unit (MMU) is adept at switching tasks from one location to another. High-speed static RAM, although ex-



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■ FROM THE EDITOR'S SCREEN

pensive and power hungry, is the best place for things to run fast; some of the new machines will feature 4K to 16K bytes of this "cache memory," whose access times are as low as 35 nanoseconds. Cache memory like this is expensive, but well worth it for its effect on overall system performance.

In addition to caching, you may also see other mainframe and minicomputer techniques in the coming 386 generation. Virtual memory requires swapping data and program segments to disk. Many high-end, high-performance computers sport disk drives specially constructed for swapping. They feature head-per-track areas that have no seek or settling time, since each track has its own head. Fast voice-coil drives can also carry special formatting and sector sizes to maximize throughput during data swap operations.

THE UNIX CONNECTION The 80386 is extremely interesting to UNIX fans, too. UNIX, the first operating system ported to any new chip these days, has become the de facto operating system for supercomputers. It already runs well on the 80386, with some interesting side benefits.

The first, of course, is speed. UNIX has always responded to hardware memory management, which the 386 has in spades. Remember, too, that several UNIX shells imitate DOS so well, you'd think you were using a single-user MS-DOS machine instead of a UNIX terminal. Given the emerging generation of DOS machines priced in the under-\$1,000 range, it's practical to use PCs as terminals; average users won't be able to tell (or care) whether they're in DOS or UNIX. The 386-based machine is an ideal minicomputer/file server, while today's PCs are powerful workstation/terminals.

While UNIX is hardly the virtual task manager some designers argue for, it has the inestimable advantage of being readily available, with excellent training, support, and documentation. In addition, both IBM and AT&T have shown that DOS and UNIX can inhabit the same computer harmoniously.

AT&T went through considerable time and trouble to make the 6300 Plus run both DOS and UNIX (see *PC Magazine*, Volume 4 Number 23, page 112). It designed

special hardware and software in order to accomplish this feat. IBM went through similar gyrations so that the RT PC could run DOS applications. The 80386 does the same thing, effortlessly.

With the 80386, there are no wrong answers, just marketing decisions. Whatever the technology, your 386 machine will be fast. How far it progresses beyond today's DOS remains to be seen.

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■ PETER NORTON

CREATING HARD DISK PARTITIONS



Few hard disk users know that they can set and control DOS partitions with DOS's FDISK. Norton explains how to use FDISK and how much disk space to give DOS partitions.

In the last issue, I began exploring the interesting and complex topic of hard disk partitions. As discussed in that column, each PC hard disk can be subdivided into as many as four relatively autonomous sections called partitions. Yet, few PC users are aware of partitions, and even fewer know how they work.

One of the reasons partitions are so unfamiliar is that they are usually all taken care of for us. Hard disks almost always come from the factory with the low-level formatting (which I discussed last time) completed (although I've occasionally seen a few mail-order disks that don't come this way and that include the software and instructions necessary for you to do the low-level formatting yourself). And very often, computer stores will spare their customers the problems of even high-level DOS formatting (which I will discuss in this column) and take care of those details before handing a new computer over to you; good stores consider this just a part of the service value that they put into the machine.

Nevertheless, it can't hurt for you to gain a bit of expertise about partitions so that you can understand how to take advantage of them and deal with any problems that may occur—and that's the purpose of this series of columns.

FORMATTING A HARD DISK When you work with a disk, the DOS FORMAT command is all you need to turn a brand-new blank disk into usable, formatted disk space. But formatting a hard disk is a three-step process. The first step, which

we covered last time, is called low-level formatting, and it creates the 512-byte sectors that become the raw empty space on the disk. The low-level format also creates an empty partition table, ready for the second formatting step, which is creating partitions.

The DOS command FDISK (and similar programs) creates and manages partitions. To make the partitions, FDISK takes a portion of the disk, identifies it as belonging to DOS, and records the fact in an entry in the disk's partition table. Until this step is completed, the disk can't be used for anything.

The last step is the logical, or high-level, formatting, which lays out the structure of the disk partition as DOS requires. This is done with the DOS FORMAT command. With a disk, the FORMAT command does both the first and last steps (low-level and high-level formatting) and skips the middle step, partitioning, which

doesn't apply to disks. With hard disks, the FORMAT command only performs the last step, creating the disk partition's logical structure. In other words, on a hard disk, FORMAT creates the disk's root directory and the File Allocation Table (FAT) that keeps track of how the disk's space is used.

CREATING PARTITIONS In this column, I'll concentrate on the second of these three steps, creating partitions, leaving the last for a future column.

Whether or not your disk comes with the partitions and DOS formatting established, you have the power to set and control DOS partitions, thanks to the FDISK program that comes with DOS. FDISK allows you to see a list of the partitions that have been set up on your disk, and it allows you to create or remove DOS partitions.

Since hard disks normally come with just the low-level formatting done, you can establish the partitions yourself. To do so, you need to boot up your computer off a floppy disk and then fire up the FDISK program. To create a DOS partition, you choose FDISK's menu option 1. At that point, FDISK will ask how big you want the DOS partition to be. You would normally give DOS the entire hard disk to work with (assuming that the size of the whole disk isn't more than the largest partition that DOS can handle: 32 megabytes). But there are certain occasions when you might want to give DOS less.

One is if you know you'll be sharing the hard disk with another operating system,



■ PETER NORTON

such as PC-IX (IBM's version of UNIX for the PC). Few users, though, know they'll be working with anything other than DOS. The real question for most users is: "Should I leave space on the disk

just to allow for the possibility?"

The answer is no. If the time ever comes (and I doubt it will), you can deal with it then. You shouldn't try to anticipate the problem because the need hardly ever

arises and because only when it does will you know how much space you'll want to allocate to each partition. Trying to guess that in advance is a waste of time.

On the other hand, there is an interesting theory about how much disk space you ought to give to your DOS partition. Some people say that under some special circumstances you shouldn't give DOS all of the space on a hard disk. The idea is that if the data you'll be putting on the disk is fixed (for example, a static database), disk performance can improve if you make the partition just big enough to hold the data. The theory is that a tight-fitting partition has a leaner, more efficient logical structure (for example, the FAT will be smaller). Likewise, any small work files that are created on the disk will be huddled close to the main data rather than spreading far away (as they can under some circumstances).

It would take some tedious testing to see if this theory really holds any water. If it does, it could improve the performance of some very high-usage databases—but the benefit is likely to apply only in very narrow circumstances. That's not the sort of thing that would apply to most users, but the idea is interesting to think about.

CHANGING DOS PARTITION SIZE If you ever want to change the size of your DOS partition, you'll use two of FDISK's menu features: the one that deletes the DOS partition and the one that creates a new partition just as if you were starting from scratch with your disk.

When you delete a DOS partition, you lose all of its contents, at least in theory. So, before you delete your partition, you may need to make backup copies of your files. "uninstall" any copy-protected programs on the disk, and so forth. After you do that, you can use FDISK to delete the partition and create the new partition, use FORMAT to lay out the logical structure of the new partition size, and then, finally, reload your data and reinstall any copy-protected programs. This can be a tedious process, if you have much of anything to preserve on the disk.

Thus, if you want to do any experimenting with partitions and the size of your DOS partition, you ought to do it on an empty disk, so that you don't have to do too much work in order to experiment.

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■ PETER NORTON

RECOVERING DELETED PARTITIONS I mentioned before that when you delete your DOS partition from a disk, all the files in the partition are lost, at least in theory. However, just as the data in erased files is still intact, so all the data of a deleted partition is still spinning around on the disk, and you can get it back if you know how to make the right moves. In fact, it's actually easier than recovering erased files.

To recover a deleted partition, all you have to do is re-create it in the same size and location where it was before. As long as you know the details of the deleted partition (which FDISK can show you), you can re-create it easily; if the partition used the whole disk, then it's no problem at all. However, if you create a partition with a size or location different from the one you had before, you won't be able to grab the old contents because the DOS logical structure for the partition won't be the same.

A SAFE, YET DANGEROUS, APPROACH On the subject of deleting partitions, there's a sticky little item you ought to know about. FDISK, naturally enough, is set up to create and delete its own partitions, DOS partitions. (Any other system that uses partitions should also have its own equivalent to FDISK that can create and delete partitions.) Suppose, however, that you somehow end up with a stray partition on your disk. You'd think that FDISK could delete it for you, simply in the interests of disk maintenance. Naturally, the DOS partition program (that is, FDISK) shouldn't just merrily blow away, say, a PC-IX partition, but it ought to be able to do so, as a sort of emergency operation. But no. FDISK takes the extremely conservative approach of deleting only its own partitions. While that may seem like a safe approach, it can be dangerous because it can leave you powerless to clean a rogue partition off your disk. I know more than one person who has been stuck with that sort of nonsense. (Later in the series I'll cover how difficult that can be to deal with.)

In a future issue, I'll look at the highest level of formatting hard disks, the logical formatting. And I'll also discuss more partitioning problems and solutions. ☐

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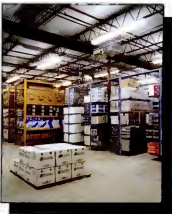
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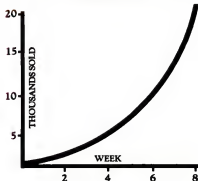
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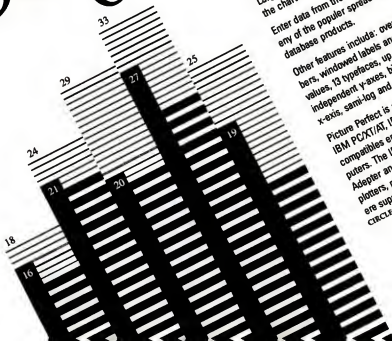
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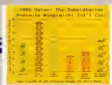
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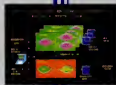
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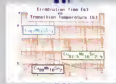


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■ JIM SEYMOUR

HOW IMPORTANT IS SPEED?



How much CPU speed in a single-user machine does anyone need? Seymour, an admitted speed junkie, ponders this question.

It's easy to become a computer speed junkie. It's a more benign disease than chemical dependency, but at least one symptom is similar: severe debilitation of your finances.

Trading up for every little CPU speed improvement that comes along can be a very expensive habit. And often a remarkably unrewarding one, because raw speed improvements of 10 or 20 percent don't show up as increased throughput, or even as greater convenience.

The sharp fall in the price of adding hard disks to PCs, followed in short order by the introduction of the PC AT, so-called turbo and accelerator cards for ordinary PCs, the Great Crystal-Swapping Wars for ATs and AT clones, and most recently the advent of IBM's RT PC, has tended to focus attention on the presumed benefits of cranking more and more speed out of our machines.

The first personal computers built around Intel's 80386 microprocessor, which will be available in a month or two, will surely continue the game: the 80386 is a veritable screamer.

RESIST THE SMALL INCREMENTS?

I'll confess right now: I'm a speed junkie, too. But I try to resist the little increments that come along weekly, saving my money for the major ratchets upward that can deliver real value.

NEC's V20 chip, for example, can produce a genuine 5 to 10 percent speed increase in standard PCs and clones in most applications. So what? Completing a J-2-3 recalc in 4.5 seconds instead of 5 seconds

is not going to significantly improve the quality of my life.

Ditto for "turbo'd" PCs. I'd rather have one than a standard 4.77-MHz PC, but in truth that 40-percent-or-so speed increase possible with the Intel 8088-2 chips doesn't make a big difference in most jobs.

And ditto for most accelerator cards, if for a different reason. When they first appeared, I found the economics of many of these boards puzzling. Why spend \$2,000 to crank up what will always be a standard PC when good, fast AT clones are available for just a little more? Worse, the real-world speed increases of these boards rarely match vendors' inflated claims, and making them work at all usually involves some funny business with drivers and batch files.

SPEED-UP BOARDS The current generation of speed-up boards makes more sense, especially the PC Technologies 286

Express half-card. It replaces the 8088 in your PC with an 80286, and, thanks to brilliant design (and, particularly, good use of cache memory), it delivers at least threefold speed increases. Best of all, it's strictly "plug and play," without any funny business, and it lists for only \$795.

Still, speed-up cards are only Band-Aids for standard PCs; real speed gains come with faster microprocessors, a wider data bus, faster crystals, and faster-access-time hard disks.

HOW FAST IS FAST? What's "fast"? Big-iron computer types use MIPS, or millions of instructions per second, as speed benchmarks. But MIPS performance varies all over the lot, depending on what the machine's doing. So MIPS-to-MIPS comparisons can be deceptive.

But in the PC world we have Peter Norton's nifty SysInfo program, part of *The Norton Utilities* toolkit. The program (better known, I find, as SI and Speed Index) defines a machine's speed as a multiple of the original floppy-disk PC's speed, which is expressed as 1.0. There may be better tests, but SI is now used so widely in the PC business that it has become the universal benchmark.

The PC AT comes in at 5.7 on SI; 8-MHz clones such as Compaq's Deskpro 286 have a rating of 7+. Both improvements are genuinely worthwhile. But crank an AT design up to 10 MHz and you get an SI rating of 10.3. All of a sudden the game gets a lot more interesting: a tenfold increase over *The Original* is the stuff of speed junkies' dreams.



■ JIM SEYMOUR

But hold on. My 12-MHz AT clone gives me an SI of 13.3 (with occasional "bounces" down to 12-something, for interrupt handling). And prototype 80386 machines running at 16 MHz with early

production '386s look like 16+ SI machines.

I think I feel faint.

Who needs that kind of speed? Anyone sorting and indexing with dBASE. Or re-

peatedly recalling big spreadsheet models. Or—and now you see where I'm going—anyone who wants to use a *Microsoft Windows* environment with a high-res color display.

THEY'VE CHANGED THE RULES I confess that I had a lot of skepticism, early on, over just who really needed so much CPU speed in a single-user machine. But as we've expanded the universe of the desktop computer, the need for that kind of speed has become painfully clear. Graph-

■ As we've expanded the universe of the desktop computer, the need for speed has become painfully clear.

ics-intensive environments, high-res long-palette color displays, complex programs, and the much larger jobs we're bringing to PCs have changed the rules.

One last thought: Remember that we're dealing with a whole system here, not just a CPU and some memory chips.

As Hal Prewitt at Core International loves to point out, an awful lot of people have been taken by dealers stuffing 70- to 90-millisecond access-time hard disks, relics from the days when the PC-XT was hot stuff, into AT-class machines—with a terrible performance penalty. You need a fast-access-time hard disk to support fast CPU operation.

And you need a fast printer, if your job is output-intensive. There's a reason why Laserjets, Okidata 2410s, and Mannesmann-Tally's sensational new MT490 are selling. Waiting all afternoon for a printout or having to run jobs overnight to avoid tying up the PC for hours makes PCs counter-productivity tools.

The problem is that when we thought no one was looking, we brought all these minicomputer-sized jobs down to our micros. And that's why we're all becoming speed junkies.

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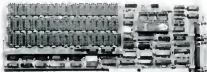


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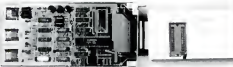
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■ STEPHEN MANES

THE FAILURE OF LOW TECH

Despite our spectacular high-technology successes, mundane, low-tech failures continue to bring our sophisticated technology to its knees.



When the space shuttle *Challenger* met its fiery demise, two words immediately flashed through my mind: low tech. From the very beginning, you just knew the problem was not likely to have anything to do with moving electrons around. The culprit would no doubt be something simple: a weld, a seam, a gasket. Tragically, it was.

When it comes to shuttling electronic minutiae, things we can't possibly see and can barely fathom, we're smug sophisticates. When it comes to the things we can hold in our hands, the familiar stuff of everyday life, we seem to be utter boneheads. The success of high tech is the glory of our age; the failure of low tech may be its shame. To put it another way: the microprocessor on your electric mixer is likely to work just fine a couple of millennia after the motor burns out.

AGONY AND WOE Consider the computer printer. Its high-tech chips can perform untold wonders in positioning dots on the page to produce a dazzling variety of fonts, graphics, and even colors. But the low-tech features—mundane items like moving that page through the machine in an orderly fashion—cause no end of agony and woe.

Just about every microcomputer printer lets the user worry about where to put the paper. Old-fashioned heavy-duty models used to offer an optional "paper catch"—a dumb-looking but functional wire basket for the stuff coming out. You almost never see one nowadays.

The result, especially with printers that

feed from the top rear, is that the user has to cobble together some means of placing printer and paper to keep the paper that is coming out from tangling with the paper going in. The select few who have also managed to get the outgoing paper to fold into a neat pile are actually treated as gods in many parts of the civilized world.

Virtually every printer I've run across includes some unique flaw so dumb you can't believe a designer could have overlooked it. The first one I owned, based on a notoriously noisy predecessor, came stuffed with foam plastic soundproofing designed to muffle the sound a bit. Unfortunately, it did not come stuffed with a fan, and the outgoing paper covered the machine's only ventilation ports. Result: for any job bigger than ten pages or so, you had to remove the soundproofing cover. Your ears might overheat, but at least the printer wouldn't.

With my newer letter-quality printer,



you can't take out the daisy wheel without removing the ribbon first—so you rarely bother. Removing and threading the tractor is no picnic either, when all you want to do is print a single envelope or an individual letter. But there are even lower-tech problems.

LOWER TECHNOLOGY Until recently, I used tipped-on stationery—paper that comes stuck to a carrier sheet via a "Post-it" type of glue. The stuff is expensive and requires special software considerations since the pages overlap slightly, resulting in a functional length of 63 lines instead of the traditional 66. But when I print something out, it's usually a job the size of a book, and compared with stripping off perforations and ripping sheets apart, being able to merely lift pages from the carrier is a godsend.

Alas, they don't seem to make it anymore. At least I can't find any. It's been supplanted by perforated sheets with "microfine" perfs that are supposed to, but don't, fool people into thinking they came fresh from a box of bond—the low-tech idea of progress.

Now, I knew I was in for a bit of adjustment when I installed my first box of the fine-tooth stuff. The tractor tension had to be adjusted, my software had to be adapted, the whole shebang. No problem.

After one maddening hour of fine-tuning, I couldn't get it to work at all. A page or two would run through fine, but then the sprockets would eat up or accordion-pleat the perfs, or the printer would move the paper up only half a line at a time, thereby

■ STEPHEN MANES

producing uneven print lines and throwing off all the subsequent pages.

Consultation with the three cryptic manuals that came with my printer was futile. Finally, I sat there holding down the line-feed

button in a desperate attempt to dope out the problem. Nothing was blocking the paper path. The sprockets were adjusted as carefully as sprockets can be. The paper was feeding straight as an accountant.

Then I discovered the culprit: what was hanging up the paper was the paper itself. For some reason, it had been perforated unevenly; the left perf strip was maybe a sixteenth of an inch narrower than the right. The extra-wide strip added just enough friction to stymie the tractor feeder. A low-tech failure had brought ten thousand dollars' worth of equipment to its knees.

A THREE-RING CIRCUS Paper in general seems to be considered beneath contempt by the computer industry. Witness, for example, the plethora of formats for the documentation that comes with hardware and software. Once upon a time it came two ways: in a grade-school three-ring binder or in IBM's. Now it comes in a three-ring circus: paperback books, spiral binders, plastic jackets, and bizarre boxes.

One ring is reserved in my personal hell for the odd sizes that even such lofty firms as Lotus have adopted lately. The boxed set of documentation for Release 2 of 1-2-3 is a wee bit taller than the IBM standard—just enough not to fit where I want to put it. The current *WordStar* documentation is even taller. Maybe the reason some companies complain about not being able to get their software on dealers' shelves is that the software won't fit on them.

A WRONG-WAY KINK Low-tech problems are endlessly irritating. Why is it that every cable always seems to have a wrong-way kink in it? After 100 years of fan technology, does it take a genius to make one that's truly silent? Can't some brilliant engineer figure out a way to make hard disks purr instead of whine? Can't the same brains that invented the modular telephone plug come up with an equally elegant connector for the world of computers?

The flash and glamour may be in the world of high tech, but there's plenty of room for improvement in the world of the low. And the very lowest tech of all seems to be a strangely ubiquitous combination of bone and sinew and biological feedback devices. Which low-tech digital device recently garbled the address from a mailing label, thereby delaying a vital shipment to me by over a week? Hint: it wasn't a laser scanner.

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■ STEWART ALSOP

SELLING SOFTWARE: SOME UNIVERSAL TRUTHS



In a notoriously fickle market, it's difficult to navigate the path to software success. Symantec's Vern Raburn shows the way with his seven golden rules.

Figuring out how to make a software product successful, no matter how good it is, is a constant conundrum for software companies.

Company after company has tried to formulate the way to design and market a software product successfully, with little success. Theories include: Make pretty much the same product but advertise it heavily; make a cheap clone; make products that offer a completely different approach; make products that have more functions in them. Still, with one exception, the originals reign supreme: *WordStar*, *dBASE*, and *1-2-3* (which knocked *VisiCalc* off in 1983). So everyone assumes that it's impossible to unseat an established product. Yet, that's exactly what people said about *VisiCalc* before *1-2-3* knocked it out of the running.

And now one recently introduced product is promising to overturn its established competitor. *Q&A*, an integrated filing, reporting, and writing product developed by Symantec in Cupertino, California, shows the potential to overthrow the competing PFS: line of products sold by Software Publishing Corp. of Mountain View, California.

PREDICTING SUCCESS OR FAILURE

It's dangerous in the personal computer software game to predict the success or failure of software, since the market is notoriously fickle about a new product. But, at the time this column was written, *Q&A* had been on the market only a few months and had already sold thousands of copies to dealers and the product was getting a large

number of warranty registration cards returned. *Q&A* wasn't gathering dust on dealers' shelves.

What's fascinating about *Q&A* is that its introduction very nearly duplicates the strategy used to introduce that other competition-knock-over artist, Lotus's *1-2-3*. Indeed, the same person—Vern Raburn—who designed the introduction of *1-2-3* (but not the product itself) for Lotus Development Corp. is now president of Symantec and is the chief architect of *Q&A*'s introduction. And the successful debuts of these two products demonstrate some universal truths about how software developers can make their software products successful.

SEVEN GOLDEN RULES Here are Raburn's Rules of Software Success:

■ Clone a popular product: Cloning is a misleading word, since the challenge isn't to duplicate a product but to distill it, throw

away what users don't like, and keep what made the product successful in the first place. *Q&A* mimics perfectly how Software Publishing Corp.'s PFS: products work, not just with the menus but with the logic of its features. (*1-2-3* mimicked *VisiCalc*'s command structure.)

■ Improve the cloned product: *Q&A* went far beyond simply a mere clone of the PFS: product. *Q&A* adds such "power" features as macros and programmability, in addition to offering greater speed and integration. (*1-2-3* added such things as variable columns, easier replication, range names, and more functions to *VisiCalc*'s arsenal, as well as graphing and data management capabilities.)

■ Introduce a new and valuable twist: *Q&A* has a module called Intelligent Assistant, which is a "natural-language" interface that allows you to ask questions of your database in something like normal English. While most knowledgeable people in the industry scoffed at the idea of using a natural-language interface for a simple file manager, users are beginning to find it useful. (*1-2-3* featured a "macro" language, which even Lotus didn't know how to promote; indeed, the manual for Version 1 of *1-2-3* gave macros only a brief mention. Now the macros are considered *1-2-3*'s biggest defense against the competition.)

■ Sell as though your life depended on it: Symantec has sent its staff out to stores to sell its product; it has promoted trade-ins and special bundles; and it has run special promotions with its distributor. (Lotus, similarly, used all sorts of special promo-



■ STEWART ALSOP

tions to get 1-2-3 started, including sending every dealer in the country a fancy introductory kit with free disks and counter displays.)

■ Get the industry to help: The personal

computer industry is notoriously interrelated, with hardware companies depending on software companies, software companies depending on distributors, and everybody depending on retailers. At a posh in-

dustry conference in December, for example, Vern Raburn personally handed out more than 200 copies of *Q&A* just so industry people would feel good about the company. In addition, the company is managed by a group of longtime industry veterans who have friends in high places in virtually every segment of the industry. (Likewise, Lotus was founded by a group of industry veterans and financed by the all-time star guru of the industry, Ben Rosen.)

■ Get on the hot list: An unfortunate feature of the software business is that the leading list of best-sellers has little to do with what customers are actually buying. Every week Softsel, the leading distributor of software, publishes the Hot List, which ranks only products that Softsel ships to its dealer customers. Wisely, Symantec gave Softsel the exclusive right to distribute *Q&A* for the first year and then organized a special promotion for the product, which bumped *Q&A* as high as number two on the list. The result: Dealers start ordering the product because it appears to be in great demand. (Lotus also negotiated an exclusive distribution contract with Softsel for the first year and took over the number-one spot on the list within weeks of being shipped for the first time.)

■ Get lucky: As in any business, perhaps more than in any other business, success in software requires luck, and lots of it. For entirely unrelated reasons, Symantec's competitor—Software Publishing Corp.—turned in a bad quarter, with a big drop in profits and a smaller drop in revenues, the same quarter that *Q&A* was introduced. The inevitable perception in the industry is that Symantec is giving Software Publishing a run for its money. (Similarly, Lotus had the good fortune to compete with a company, Visicorp, that was spending most of its resources trying to develop an entirely different product, *Visi On*. Visicorp never realized how badly 1-2-3 was hurting *VisiCalc* until it was too late.)

So, to make a successful software product, all you have to do is make a lot of friends in the business, design and build an incredible product, sell it to anyone who will walk in the door, make some smart deals, and hope to high heaven that you get lucky. No problem.

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PROJECT DATA BASE II

*Project Database
is back—
with over 100
databases.
The market has
changed
and so have many
of the old
standbys,
but plenty of
new products are
giving them
a run for
their money.*

Two years ago *PC Magazine* started what was to become an industry tradition by publishing *Project Database*, the first of a series of large-scale computer-product reviews based on structured, consistent testing procedures. That first project canvased a field of 68 database products and spanned seven issues of the magazine.

Now it's time for us to survey the database field once more. This time, even more of them are on the market: more than 100 relational and flat-file database managers will be covered in this and the next two issues of *PC Magazine*.

Many of these products will look familiar, at least if you have been a *PC Magazine* reader since 1984. Many of these older products have new features and improved capabilities; others have left the field. But new ones have since joined the fray, and the net result is that there are more database products to choose from that have more and better features than ever before.

For the most part, these newly added features—such as improved relational capabilities and more-flexible data structures—make products easier to use and more adaptable to your needs, especially if you're a novice database user. As a result, you no longer have to fight your way through awkwardly planned screens and incomprehensible dialogues necessary to set up report formats—not to mention learn how to program—to get your work done.

The simpler flat-file products and many of the newer relational ones are almost immediately accessible to inexperienced users. Even some of the higher-level programmable databases have easier interfaces that include menu-driven



Illustration: Jeffrey Scher

■ PROJECT DATABASE II

data-base queries and prompted "dialogues" for defining files.

Another new factor in the database race is the wider variety of data types, field specifications, and data manipulation functions offered. Besides the traditional choice between alphanumeric and ordinary numeric fields, you are now able to use floating-point and money fields, a variety of date and time types, Boolean logic fields, and even fields that can be whole text files. At least one database even has "smart" name fields; the program sorts on the last name.

You can expect many database products to automatically set specifications for range testing, insert default values, calculate result fields from inputs, and make sure that "must-fill" fields are filled and that required fields have values. And most of today's products can index and sort records based on a variety of fields and combinations of fields; they even allow you to restructure data files without the inevitable aggravation "provided" by older, less slick products.

POWER VS. EASE OF USE Of course, how many functions and features are included with each database product depends on what the product's designers feel is important to its customers. A product that includes every available field type and report function in an easy-to-use format with complete help screens and error messages can take up an immense amount of memory and cost a correspondingly large amount of money. Most of the software products we reviewed in these three issues of *PC Magazine* try to make the best compromise between ease of use and flexibility and between quality and price.

Database purchasers must also make this compromise in choosing a product. If you are already a programmer or think you'd like to learn how to program in a database language, you would probably want to steer toward the more complex databases that allow you to use a programming language to structure the types of files and reports that exactly suit your needs. On the other hand, if you simply want to drop data into a file and pull it out as some kind of organized information, then you'd probably be interested in a product that offers automatic reporting and

would probably accept whatever report format the program gives you.

Database products can also vary greatly in their approach to data input and the design of input screens. Earlier programs insisted that you design screens by entering

■ You no longer have to fight your way through awkwardly planned screens and incomprehensible dialogues in order to get your work done.

the row and column coordinates for each field on the input screen, an awkward system at best. Many of today's newer models either enable you to "paint" their screens by placing a cursor at the point where the field should begin or supply a preprogrammed format.

You may also need to consider where your information is coming from and how it's going to get into your database. If you already have a large amount of data on disk or need to share the data with a spreadsheet or word processing program, then the ability of a product to import and export data efficiently in a variety of formats is vital.

THREE PRODUCT CATEGORIES

Although a good deal of the testing we did for this project is similar to the testing we did for our first database project, there are certain differences, both in criteria and approach (see sidebar, "Testing the Databases," for details). Also, we've simplified things by using three categories of database products rather than four.

The first category covers flat-file databases: those products that store, organize, and output data sequentially. Sequential data organization is the most basic type, but its simplicity doesn't mean that these cannot be useful or, indeed, highly sophisticated products. Many of the Category 1

databases are very slick indeed and contain such advanced features as automatic date fields, elaborate report overlays, and multilevel indexing and sorting. A few even have some relational functions, although they are usually available only as part of the reporting process.

While Category 1 databases may suit the needs of small businesses and occasional database users, most of you will probably be more interested in relational products, which we call Category 2 databases. While your definition of a relational database probably depends on whether you are looking at it from an applications or technical viewpoint, most agree that the core requirement of such a product is its ability to link two or more files together through at least one common field.

Category 3 databases add programmability to relational and flat-file data handling. Most of these products come with their own query languages with which you can write your own input or report forms, although a few do work with standard PC languages such as Turbo Pascal, C, BASIC, or COBOL.

The classic Category 3 database is, of course, *dBASE II*, which has served as a model for dozens of competitors (you just might want to include *dBASE III* in the list of competitors) and which has, in addition, spawned an entire industry of add-on products, books, and prewritten application modules. In fact, many users consider *dBASE* less a database product than a generic programming language for creating and using databases.

While there are many *dBASE* imitators, not all Category 3 products fall into that mold. Many Category 3 databases let you choose between using built-in functions or taking things into your own hands and programming everything yourself. In the features chart that accompanies the reviews, all features that can be programmed using a Category 3 product's proprietary language are considered supported.

You will notice that only Categories 2 and 3 appear in this issue; the Category 1 reviews will appear in *PC Magazine* issues 13 and 14. While at first glance, this order may seem odd, we are basing it on our experience with the earlier database project. When we ran the less-sophisticated program reviews first, we were deluged with

calls from impatient readers who wondered if they could obtain "previews" of the more complex product reviews. This time, we decided to run our reviews of the relational and programmable products first.

As with many PC software products, databases are not always easy to fit into predefined categories. There are a few Category 1 products that have limited relational capabilities and a few that are even somewhat programmable. Some of the Category 2 products turned out, on closer examination, to have hidden programming

languages. As a result, quite a few products were moved from one category to the next during the course of *PC Magazine's* testing because our perception of their abilities changed.

DATABASE SUBCATEGORIES We also separated out three additional subcategories of database programs that we reviewed on their own because they are geared toward specialized needs.

The first group is database language compilers, and it appears in this issue. Compilers, which are usually meant for

use with *dBASE II* or *III* programs, help users program and use these programmable products with greater efficiency and speed.

We also decided to run separate tests on text-based database managers, a new type of database just beginning to hit the market. These products eschew the more formal table format of most database products in favor of an unstructured text (English language) data storage that allows you to search for any word or phrase in the database. While most tend to be somewhat slower than traditional database products,

OUR REVIEWERS

Testing this many database programs took a lot of people power. Eighteen highly qualified reviewers handled the testing and reviewing chores for this special issue:

Richard Aarons is a contributing editor of *PC Magazine*, as well as senior editor of *Business Communication Aviation Magazine*. He specializes in database and advanced languages in addition to the evaluation of airplanes, avionics, and aviation computer software and hardware.

Joe Desposito was formerly a technical editor at *Computers & Electronics and Creative Computing*. He is now a free-lance writer specializing in computer software and hardware.

Glenn Hart is president of his own consulting firm in Monsey, New York, a microcomputer company specializing in word processing. He is also a contributing editor of *Creative Computer* and *PC Magazine*.

Bill Harts is president of Packaged Solutions Inc., a communications software company in Melville, New York. He is also the author of the *AST-3780* package and has written frequently for *PC Magazine*.

David Hoffman is a microcomputer consultant specializing in database and graphics applications. He has trained groups in the use of popular business software and designs custom database

systems. He has been a member of the board of directors of the NYPC Users' Group for several years.

Dara Pearlman is a free-lance writer based in California who contributes frequently to *PC Magazine*.

Charles Petzold is a contributing editor of *PC Magazine*. He writes the *PC Tutor* column and frequently contributes to the Programming/Utilities and the Power User columns.

John Phillips is the director of advanced technology for Five Technologies, a human resources consulting firm located in Woodcliff Lake, New Jersey.

Alfred Poor is president of Soft Industries, a Connecticut software and hardware consulting firm, and a frequent contributor to *PC Magazine* on a variety of topics.

Vincent Puglia writes frequently for *PC Magazine*. Formerly, he did editing for several newsletters and the New York City Board of Education. He is also a free-lance consultant.

Robin Raskin is a New York-based free-lance technical writer and frequent contributor to *PC Magazine* who specializes in educational and family-computing issues. She writes for a number of computer publications and teaches technical writing at Baruch College.

Dick Ridington is a consultant and principal at Soft Industries Corp in Connecticut. He is coauthor of *Hidden Pow-*

er of Lotus 1-2-3 Using Macros.

Tony Rizzo is assistant director of information technologies at New York University School of Continuing Education. He specializes in data processing, office automation, personal computer training, and curriculum development. Rizzo serves as a professional computer consultant for the school division of personnel and industrial programs.

Phoebe Schmidt is an independent computer consultant and free-lance writer living in New York City.

Brian H. Stephens is a consultant specializing in PC applications, in particular, word processing and communications.

M. David Stone has been a science writer since 1975, specializing in computers since 1981. He has written three computer books, including *Getting the Most from WordStar and MailMerge* (Prentice-Hall), and was senior contributor to three other computer books. Stone is also a computer consultant.

Nancy Trespass is a microcomputer sales consultant at McGraw-Hill. A graduate of Lehigh University, she keeps herself up to date on computers by taking courses at New York University's Information Technologies Institute.

Phil Wiswell is a free-lance writer based in New York. He has written frequently for *PC Magazine*. He also has his own computer-consultant business.

TESTING THE DATABASES

In order to put these products through their paces, PC Magazine Labs had to create benchmark tests that would challenge the products in a corporate application.

Creating benchmark tests for database programs is perhaps one of the most difficult tasks *PC Magazine* has ever faced. It wasn't easy when we did it for the original Project Database (Volume 3 Number 11) 2 years ago, and it wasn't easy this time. Databases, especially relational ones, tend to have features galore; a user can pick and choose between any number of ways to solve a given problem. In contrast, benchmark-testing hardware or backup software is easy since their individual functions, which are well-defined, dictate the design of the benchmark test.

For Project Database II, we had to create procedures that were stringent enough to test the upper limits of the tested programs and yet flexible enough to allow the reviewers to complete the tasks creatively. To compound the problem further, we needed two sets of benchmark tests and data files: one for the flat-file database managers, which permit only one file to be open at a time, and another for the relational databases, which allow you to open as many files as students open cans of beer at fraternity parties.

We went back to the original Project Database material and took a long look. We kept the testing procedures and personnel system files for the Category 1 programs. We threw out the files for Category 2, reworked those for Category 3, and changed the testing so that Categories 2 and 3 were performing all but one of the same tasks. We reasoned that if the main distinction between a Category 2 program and a Category 3 program was the programming language, then the former group should have no trouble completing the nonprogramming tasks of the

latter category. And if they did, well, then we've learned their limits.

THE DATA The Category 1 reviewers were given data files with 25 records to work with. Admittedly, a database of 25 records is small and certainly not typical

■ We needed separate benchmark tests for the relational databases, which allow you to open as many files as students open cans of beer at fraternity parties.

of the file size for even a small business. However, not all of the programs in this group are capable of importing files, and if we'd asked the reviewers to enter 500 records, we would have risked a coup. Each record had nine fields: first and last names, address, city, state, ZIP code, employee number, department name, and salary.

The new relational database that we created for the Category 2 and Category 3 programs contained three files: employee, department, and salary. The department file contained five three-field records; the fields included the department number, department name, and cost-center number. The other two files contained 500 records each. The salary file consisted of the employee number, the current salary, the previous salary,

the starting date, and the date of the last raise.

The employee file included the department number, the employee number, and the employee's first and last names, address, city, state, and ZIP code. Because the employee file maintained both primary keys, it acted as the focal point of the database; to gain access to either of the other files, you had to go through the employee file. In point of fact, you could consider it the main file.

The database contained only the company's most current records. That is, if an employee moved, changed departments, or received more than one raise since being hired, then that record was presumed archived. We could have used a different approach but, after some discussion, decided that this one provided the most control and flexibility over the benchmark results.

THE TASKS The tasks were twofold: to test the program's ad hoc facilities and its report generation capabilities. The first set of tasks was similar for all three categories. We asked the reviewers to sort the records by last name, search for a specific record based on two fields within the same file (last name and city for Category 1, last name and department number for Categories 2 and 3), index the records by last name, and then redo the search with the index active.

We designed the reporting tasks to stretch the program's capabilities. Reviewers of Category 1 programs were asked to design a report with a descriptive header and page number footer. The report was to include the employee's last name, identification number, department, and salary. We also asked that the last-name index be active and that to make things a little more interesting, the

report be sorted by salary within the department.

The Category 2 reviewers had to perform a similar task—the difference being a breakpoint on the department field. At the end of the breakpoint, the report subtotaled each department's salary. The subtotals were then totaled on the last page of the report. Two indexes—last name and department number—were active. If the program could open only two files at a time, the reviewer was to produce a report that would list the department name, department number, employee name, and employee number.

The last task involved using the program's procedural language to generate a report that would compute for each department and the database as a whole the amount of each employee's last raise, the average salary increase, and the total of the current salaries themselves.

Finally, we encouraged the reviewers, especially those evaluating products in Categories 1 and 2, to attempt to perform the tasks for the higher categories. If the benchmark tests did not tap a particular program's "shining" feature, such as macros and graphing, the reviewer tried it out.

THE RESULTS We tested all the programs on IBM PC-XTs with 640K bytes of RAM. The 10-megabyte hard disk drives were formatted with DOS 2.1 and the buffers were set to 20 in the CONFIG.SYS file. When possible, the program was installed in a subdirectory. All of the tasks were timed from the moment the reviewer lost control of the keyboard until the moment the program completed the operation and displayed the result or a completion message on-screen.

All the ad hoc tasks are operations that you would normally perform in the

course of using a database program. None are exceptionally difficult. Therefore, if a program failed to complete one, you know it lacks a feature that almost everyone would consider basic. The only exception to this rule is indexing. A program with a very efficient search algorithm may not need indexed fields to locate records quickly. Also, if you intend to maintain only a small database, indexing may actually slow down performance. (The benchmark test results should show whether this is the case.) However, if you find yourself waiting for Godot everytime you need to look up something, you know you need an index.

Even though the Category 1 files contained $\frac{1}{2}$ the number of records as the other categories, you may notice some Category 1 programs take more time to complete a task, such as a search, than do Category 2 and 3 programs. The reason is usually that many flat-file programs require an extra step to report results in user-defined forms, while most relational database programs make use of the command line, reporting results as soon as they are available.

The resulting personnel system database for the relational databases may seem simplified in comparison to the original Project Database files (in which certain employees had more than one department or salary record to simulate a department and salary history), but it did manage to present some of our reviewers with problems the original data files would not have. By eliminating the employee number in the department file, we set up a situation where the reviewers either had to use three pointers, one for each file, to perform a relation on two files, forming a new file that could then be looked up; or they had to fail at the task. —Vincent Puglia

their unusual data handling should appeal to a whole new group of users.

Finally, we will be publishing a separate section on mailing-list managers. These products are for one specific need only: managing address lists. Most mailing list managers are simple, flat-file programs that have been preformatted for business address listings, and, while some can be altered somewhat, they are the least-flexible databases we reviewed. But they are also in demand by companies that may not need a more complex product, and are worth looking at.

When we first began planning for this second database review project, we started

■ Many products turned out to have disappeared from the market or been absorbed into other software. We pared down the list to "only" 100-odd products.

with a list of about 280 products. Many of them turned out to have disappeared from the market or been absorbed into other software. Other products were dropped because they ran on systems not compatible with DOS or were not really database managers. We managed to pare down the list to "only" 100-odd products.

We distributed those programs to 30 of our top reviewers for testing and review. Each author was given a typical business database scenario, a series of ASCII files to import, and a detailed questionnaire. The questionnaire data is found in the tables of program features; each author wrote a short review containing personal impressions of the product. By including both factual information in the tables and the impressions of experienced PC users in the reviews, we believe we're giving you the most comprehensive look possible at today's database managers. [E]

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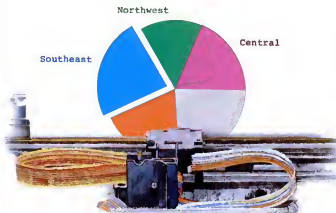
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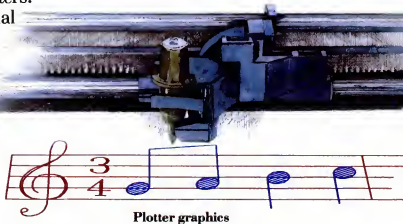
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These databases are the cream of the crop: systems that place experienced users in full control with enough programming power and flexibility to devise their own individualized business applications

PROGRAMMABLE RELATIONAL DATABASES

If you're a systems consultant or a power user by preference, or if your database needs exceed those of ordinary mortals by a substantial order of magnitude, then programmable relational database managers are just what you're looking for. The products in this category use a strong portfolio of sophisticated relational database technologies, and they let you program each application so that it exactly meets your needs.

The price of all this power, of course, is that you have to do much or all of the work yourself in such areas as database and program design, user interface, and overall systems strategy—not to mention the actual coding involved in creating the programs. Lesser products, such as the normal relational databases also reviewed in this issue, and flat-file products that will be covered in the next two issues, do all of the basic housekeeping work and programming for you.

We placed our reviews of 32 programmable relational database products ahead of the other product categories in Project Database II because they are the technical leaders of the pack. Between the incisive comments of *PC Magazine's* database review team and the performance and feature data in the chart on the following pages, you are sure to find the right programmable relational database for your special needs.—John Dickinson



Illustration: Jeffrey Scher

PROGRAMMABLE RELATIONAL DATABASES

File Structure Limits										Data Types and Sizes					Times in Seconds					Data Entry and Editing												
PRODUCT NAME	PRICE	Number of fields per record	Record size	Records per data file	Records per database	Field size	Characters	Numeric	Integer	Floating-point	Money	Logical (Boolean)	Date	Time	Long text	Sort data file by last name	Index records	Retrieve and display record with index	Retrieve and display record without index	Execute entire report	Execute salary increase report	Range testing	Default values	Require specific values	Look-up to external data table	Double entry verification	Required fields	Must fill field	Forced upper case	Date conversions	Automatic incrementing fields	Unique fields
BDSS	990	255	65K	28	×	255	■	■	■	■	■	■	■	■	NA	44	1	41	476	741	■	■	■	■	■	■	■	■	■	■	■	■
◆ Clipper	695	1024	×	18	108	32K	■	■	■	■	■	■	■	■	107	12.2	<1	<1	288	643	■	■	■	■	■	■	■	■	■	■	■	■
Condor 3	650	127	1024	65534	65534	127	■	■	■	■	■	■	■	■	38	23.9	5	2.8	158	420	■	■	■	■	■	■	■	■	■	■	■	■
PC DataEase	600	255	4000	65535	168	255	■	■	■	■	■	■	■	■	NA	NA	NA	1.7	455	680	■	■	■	■	■	■	■	■	■	■	■	■
Datatore:pro	\$ 495	512	16384	LC	LC	80	■	■	■	■	■	■	■	■	921	11.53	20	0.95	602	1500	■	■	■	■	■	■	■	■	■	■	■	■
dBASE II	295	32	1000	65535	×	254	■	■	■	■	■	■	■	■	89	62	30	37	612	838	■	■	■	■	■	■	■	■	■	■	■	■
PC dBASE III Plus	695	128	4000	18	108	254	■	■	■	■	■	■	■	■	14.2	10.7	0.1	3.7	488	531	■	■	■	■	■	■	■	■	■	■	■	■
◆ dBase/Compiler	750	32	1000	65535	65535	254	■	■	■	■	■	■	■	■	72	29.2	3.5	9.1	403	674	■	■	■	■	■	■	■	■	■	■	■	■
◆ dBase III/Compiler	750	128	4000	28	28	254	■	■	■	■	■	■	■	■	75	33.7	5.2	10.5	361	551	■	■	■	■	■	■	■	■	■	■	■	■
◆ dBaseMAN	\$ 395	64	2000	65535	65090	254	■	■	■	■	■	■	■	■	47.2	38.7	2.7	62	540	1084	■	■	■	■	■	■	■	■	■	■	■	■
DDquery	750	255	4096	28	28	4096	■	■	■	■	■	■	■	■	NA	NA	NA	200	1020	■	■	■	■	■	■	■	■	■	■	■	■	■
Enable	695	254	64517	65000	65000	254	■	■	■	■	■	■	■	■	24	25	14.5	11.5	69	92	■	■	■	■	■	■	■	■	■	■	■	■
FilePro 16 Plus	990	999	16K	16M	16M	999	■	■	■	■	■	■	■	■	210	450	1.5	8	240	330	■	■	■	■	■	■	■	■	■	■	■	■
◆ FoxBASE	395	48	1000	65535	×	255	■	■	■	■	■	■	■	■	33	21.9	2.7	3	345	729	■	■	■	■	■	■	■	■	■	■	■	■
GOLDDatabase	\$ 595	300	16K	×	×	80	■	■	■	■	■	■	■	■	241	305	0.5	4.5	180.5	5240.5	■	■	■	■	■	■	■	■	■	■	■	■
Informix-SQL	795	×	32K	×	×	32K	■	■	■	■	■	■	■	■	40	2.5	0.1	2.5	120	120.5	■	■	■	■	■	■	■	■	■	■	■	■
KnowledgeMan	920	255	65535	×	×	65534	■	■	■	■	■	■	■	■	57	33	1	2	257	438	■	■	■	■	■	■	■	■	■	■	■	■
Mainstay	1495	×	×	×	×	×	■	■	■	■	■	■	■	■	14	16	18	13.5	358	408	■	■	■	■	■	■	■	■	■	■	■	■
Metallie	995	250	64K	2000	10000	235	■	■	■	■	■	■	■	■	85	31	4	825	1125	■	■	■	■	■	■	■	■	■	■	■	■	■
NPL-R	\$ 595	255	10000	×	×	999	■	■	■	■	■	■	■	■	96	15	7	10	228	1800	■	■	■	■	■	■	■	■	■	■	■	■
Oracle	1000	254	90K	×	×	240	■	■	■	■	■	■	■	■	NA	87	1	7	430	5400	■	■	■	■	■	■	■	■	■	■	■	■
Paradox	695	255	4K	65000	×	255	■	■	■	■	■	■	■	■	7	14	4	5	94	132	■	■	■	■	■	■	■	■	■	■	■	■
PC-Focus	1395	256	4096	×	×	250	■	■	■	■	■	■	■	■	349	128	128	700	956	■	■	■	■	■	■	■	■	■	■	■	■	■
PractiBase	99.95	60	2000	×	×	256	■	■	■	■	■	■	■	■	37	64	3	1	2175	3490	■	■	■	■	■	■	■	■	■	■	■	■
Probe	\$ 395	64	1024	65536	39312	64	■	■	■	■	■	■	■	■	NA	17	6	6	790	1290	■	■	■	■	■	■	■	■	■	■	■	■
Q-Pro4	595	64K	64K	×	×	255	■	■	■	■	■	■	■	■	71	128	9	15	936	1394	■	■	■	■	■	■	■	■	■	■	■	■
PC R-base Series 5000	700	400	1532	LC	LC	1532	■	■	■	■	■	■	■	■	12.9	31.20	3.52	5.69	681	804	■	■	■	■	■	■	■	■	■	■	■	■
Revelation	950	×	64K	×	×	32K	■	■	■	■	■	■	■	■	61	120	0.5	6.0	120.5	120.75	■	■	■	■	■	■	■	■	■	■	■	■
Savvy PC	139	254	254000	60000	60000	1000	■	■	■	■	■	■	■	■	NA	218	2	91	255	302	■	■	■	■	■	■	■	■	■	■	■	■
The Sensible Solution	\$ 695	×	26000	16M	16M	255	■	■	■	■	■	■	■	■	NA	9*	2.2	1.5	15	17	■	■	■	■	■	■	■	■	■	■	■	■
The Smart Data Manager	495	255	4K	1M	1M	1028	■	■	■	■	■	■	■	■	NA	8	1	1	187	255	■	■	■	■	■	■	■	■	■	■	■	■
TAS	199	×	10254	17M	17M	255	■	■	■	■	■	■	■	■	NA	107	15	2	195	295	■	■	■	■	■	■	■	■	■	■	■	■
Team-Up	795	1000	8187	×	×	8187	■	■	■	■	■	■	■	■	65	120	0.5	4	125	183	■	■	■	■	■	■	■	■	■	■	■	■
10 Base	495	×	32000	×	×	9999	■	■	■	■	■	■	■	■	240	78	5.5	16	360	2880	■	■	■	■	■	■	■	■	■	■	■	■
TSM	\$49.95	400	16000	32767	32767	2000	■	■	■	■	■	■	■	■	NA	86	2.1	2.1	482	16000	■	■	■	■	■	■	■	■	■	■	■	■
VersaForm XL	99	75	4000	25000	×	78	■	■	■	■	■	■	■	■	65	65	1.3	NA	3	67	■	■	■	■	■	■	■	■	■	■	■	■
Zim	795	8K	8K	×	×	8K	■	■	■	■	■	■	■	■	59	59	6.3	NA	204	243	■	■	■	■	■	■	■	■	■	■	■	■

LEGEND: ×: unlimited NA: not applicable LC—Limited by machine capacity NFL—No field limit *—Timed using 25 records only PC—Indicates Editor's Choice

[illegible]

—Indicates that product is a database compiler ☐ no import or export ☒ import ☐ export ☒ both import and export K—Key disk *poor †average **good ‡excellent

PROGRAMMABLE RELATIONAL DATABASES

PRODUCT NAME	Input Facilities			Output Facilities			Special Features										High-level language interface																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
	Screen definition	Report generation	Report definition method	Output reports to:	Query language		Paging	Coordinate specification	Automatic Programming	Number of screens per file	Number of files per screen	Prompt messages for fields	Arithmetic functions	Aggregate functions	Statistical functions	Multiple file reports		Prefilled mailing labels	Printing	Form layout	Automatic	Programming	Stored report definitions	Headers	Footers	Printer setup facility	Printer	Screen	Disk file	Multiple file access	Stored queries	Boolean expressions	Phonetic searching	Global searches	ODS 2.0 directory support	Change default directory	Access from another directory	Macros	Customize keyboard	Customize color screen	User access security provisions	Data encryption	BASIC	Pascal	C	COBOL	FORTRAN	Assembler	Proprietary high-level language																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
BOSS	■	■	■	1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

LEGEND: ∞: unlimited ♦—Indicates that product is a database compiler —Indicates Editor's Choice

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BOSS

BOSS (Business-Oriented Software System) is a sophisticated relational database manager designed for use by programmers. While all major features are accessible through a menu-driven interface, the program is best used with the included Megabasic language. **BOSS** has its roots in the 8-bit micro world of 1980 and boasts an easy migration path to the IBM PC environment for its earliest users.

BOSS performs all expected functions of a full-featured database management system but distinguishes itself by its ability to handle very large tables, by the tools it makes available to developers, and by its network support. The initial release for the IBM PC was concurrent with that of the first network version. **BOSS** is available in seven multiuser versions, including Novell, IBM PC, and 3Com networks, plus XENIX.

MORE ADVANCED THAN DBASE II

The distributor, American Planning Corp., is careful to point out the advanced capabilities of **BOSS**. APC president John Cleckner claims that **BOSS** is too sophisticated for someone whose problems can be solved with **dBASE II**. In an unusual twist to customer support, the company reduces the price of its network version of the prod-

uct for users who attend a free 1-day training session. The reasoning is that a properly trained user will ultimately cost the company less in support time.

Transportability across different systems is another feature of **BOSS** and its underlying Megabasic variant of the BASIC language. **BOSS** databases are upwardly compatible from 8-bit to 16-bit machines, are compatible with a variety of 16-bit microcomputers, and can easily be upgraded from single- to multiuser systems.

Advanced tools for system development are available to the **BOSS** user who needs to design applications for end users. An extensive help system is built into the program, but the actual text of the screens may be supplied by the programmer. Customized selections are easily added to the standard **BOSS** menus.

BOSS also provides a security system that is more complex than most. Files can be designated by a number from 1 to 99, and end users may access files with numbers in their assigned range. This allows greater control than traditional level-oriented approaches.

The reporting tools included with **BOSS** are extensive, though they require some training and experience to master. By maintaining internal variables during report generation, **BOSS** can make comparisons between successive records and react according to preset conditions. Data tables can actually be updated during the reporting process. A wider than usual variety of mathematical operations can be performed within reports.

BOSS can export and import ASCII data from other programs in a number of ways. In addition to comma-delimited and fixed-field-length text files, **BOSS** allows you to define individual data formats.

THE MEGABASIC LANGUAGE The BASIC programmer may view **BOSS** as an extension of the proprietary Megabasic language. Megabasic features addressing of 1 megabyte of memory, debugging aids, and speed advantages over other BASICs. Its editor has global search, list, and edit capabilities. You can renumber lines globally or within a defined region. Statistics on variables and on the state of the machine are available during development.

Megabasic offers structured program-



EDITOR'S CHOICE

Ashton-Tate's **dBASE** series of database management systems have become the standard by which all other such products measure themselves. Their latest version, **dBASE III Plus** is a worthy addition to that company's family of products. It adds a multitude of new features, including an interactive Query mode, improved report generation, expanded error trapping and debugging capabilities.

R:base Series 5000, from Microrim, Inc., is one of **dBASE III Plus**'s strongest contenders. It includes its own procedural language;

a slick compiler and applications generator, and also, according to reviewer Vincent Puglia, an overall sense of coherence and integration that **dBASE** lacks.

Last but certainly not least, Software Solutions' **DataEase** is an elegantly operating product that is straightforward enough for less experienced users yet includes enough advanced information managing features for most complex business applications—unusual in a database, where ease of use and flexibility do not generally coincide.

■ PROGRAMMABLE RELATIONAL DATABASES



FACT FILE

BOSS, Version 9.0

American Planning Corp.
4600 Duke St., #425, Alexandria, VA 22304; (800) 368-2248; (703) 751-2574

List Price: \$990 **Requires:** 384K RAM, hard disk drive, DOS 2.0 or later.
In Short: A highly sophisticated program that offers programmers its own Megabasic version of the popular BASIC language.
Not copy protected.

CIRCLE 608 ON
READER SERVICE CARD

The fastest way to call up a record in BOSS is to enter known information into the indexed fields; the remaining information in the record appears almost instantaneously.

B.O.S.S.
Business Oriented Software Systems

NETWORK
DATA BASE SOFTWARE
American Planning Corporation
PO BOX 100
ALEXANDRIA VA 22304

Enter data into a data file

Enter key? ☐ Enter last? ☐ Enter key no? ☐

Enter first name: Enter last name:

Enter address: Enter state: Enter zip:

Enter city:

ming features that overcome many of the criticisms of BASIC. You can design programs in a modular fashion and access them by segment labels of up to 250 characters rather than line numbers. Sections of code can be swapped in and out of RAM to make the most efficient use of memory.

BOSS is fully functional as a standalone, menu-driven package and performs its duties well. But the menus get a little "thick," and there are times when you must visit several menus in order to accomplish one logical task. According to the American Planning Corp., many problems are solved more elegantly using the Megabasic programming alternative. The interactive interface can be thought of as a convenience. The real strengths of the program are available to programmers putting together complex applications.

—David Hoffman

CONDOR 3

Condor 3, another old-timer in the micro-computer database management arena, first saw the light of day in the CP/M envi-

ronment of 1977. Sometimes such longevity yields mature, powerful software that has been revised to improve the breed; in other cases a product can stay mired in its foundations and not keep pace with new technologies. Condor 3 seems to straddle the two situations.

Many of Condor 3's operational characteristics reflect its CP/M roots. The program doesn't use any of the PC's standardized graphics; it uses asterisks to dress up screen displays. While this hardly disqualifies it, Condor 3 should think about moving its product more firmly into the PC environment.

SOPHISTICATED MANEUVERS

Condor 3 features a menu-driven interface with good on-line help and lists of the available data files and fields. A Smart feature records your instructions into command files for repeated execution, and another option allows you to construct user-defined menus. These systems are very nicely done and easy to use.

A command-line interface is still available if you want to type commands and parameters at a prompt line. The commands can be quite lengthy, and there's no way to

edit them if you make a mistake. Suffice it to say that the new menu system is much better.

Painting screens is quite easy, which is a good thing because the screens you define are used for almost every entry and editing operation. An excellent carryover system controls default values and repetition of information from previous records.

Condor 3's design limits indexes to one per dataset (at least without some rather odd manipulations). Several Condor 3 operations invalidate the index, and editing the key field isn't allowed either. Frequent reindexing may be necessary for some types of data manipulations, but Condor 3's sorting and indexing are so fast that this isn't a major difficulty.

Condor 3's high-level language barely qualifies for the term. You can store and execute files with legal Condor 3 commands, but the only language constructs are If, Endif, Let, Message, Get (from the keyboard), End, and Abort. That's it—no looping commands and, in fact, no way to examine each record individually. The language allows only nine variables and up to 127 lines maximum in a command file.

The report generator is good, although it omits automatic centering of headers, footers, and so forth. Modifying the report specification is sometimes cumbersome. What is provided works quite well, though. Import/export facilities are also moderately flexible, offering several data types not usually available but omitting such current interchange formats as .DIF, SYLK, and WKS.

Condor 3's basic approach to database management emphasizes posting transactions to existing data. This philosophy is a good one, and Condor 3 also makes it easier for you to maintain audit trails and transaction logs than some of its competitors do. Condor 3 uses the relational Join and Project commands much more than other products do to implement this methodology. Once you grasp this concept, some sophisticated and secure data manipulations are possible.

SOME ROUGH EDGES The program is not particularly easy to use, however. I had to define a rather complex series of manipulations to generate the PC Magazine Labs reports, to some degree because

of *Condor 3*'s overall style. *Condor 3* implements relational techniques in a manner that allows shorter report definitions, but the style is much less like traditional high-level languages. While the report system isn't bad for single-file reports, I don't think the average user has the ability to develop multifile reports of any complexity (of course, *dBASE* programming is also beyond most users too). Even after my extensive efforts, *Condor 3* couldn't produce every aspect of the PC Labs test assignments (ascending and descending sorts couldn't be combined, certain accumulations weren't possible, and so forth). *Condor 3* is quite fast, though, and the test reports were generated rapidly.

Condor 3's tutorial in the manual is effective, but a couple of errors require digging to figure out. This shouldn't happen with a mature product. *Condor 3*'s support staff, however, are unusually knowledgeable and friendly.

Condor 3 has many good aspects, and you can do some sophisticated things with it. The company offers several well-designed training packages for the program, and it does quite well in the educational market. Nevertheless, I feel a product that

has been around as long as *Condor 3* has should have fewer rough edges. The procedural language is weak, the adaptation to the PC is lacking, and the documentation needs improvement. Also, *Condor 3* is not inexpensive. Further development could build on the sound foundation of the current *Condor 3* and yield a better program.—Glenn Hart

DATEASE

Many database managers purport to serve both beginners and experienced users. *DateEase* is one of the few programs that actually offers power and flexibility combined with ease of use.

Installing *DateEase* is a straightforward process. The program isn't copy protected and supports special effects on a long list of printers. You can select up to two different printers, a specified start-up menu, a help level, screen color usage, and a security level (the powerful security system has multiple permission levels down to the field level). *DateEase* uses color to wonderful advantage, with very attractive

screens throughout, and the operator interface gives you the choice of using either function keys or standard menus. These extra "luxuries" make the program easy to learn and use.

DateEase uses forms that you paint on the screen to enter and edit text, retrieve entries, and design reports; helpful cut, copy, and paste options make screen painting simple. The field types available are unusually flexible and include social security numbers, phone numbers, and "choice" fields (a clever feature that automatically sets up multiple-choice fields). Field names can be up to 25 characters long, and you can assign a very detailed set of characteristics to each field.


During data entry, *DateEase* does not automatically clear the screen when you have completed a record, allowing you to reuse any of the field entries or the entire form. You can easily set up default situations to handle repetitive data. You locate specific records for editing by entering target values in the fields.

DateEase allows you to define your own custom menus easily. Any *DateEase* command, DOS command, batch file, and so on, can be invoked from such menus, and you can designate any menu as the start-up menu to bypass the normal *DateEase* menu system.

QUERY SYSTEM You can extract information with an excellent menu-driven system that employs "query by example" techniques to select subsets of the database. You can convert such queries to either of *DateEase*'s report types: quick or full. Both types of report allow detailed query definition and full control over the format of finished reports. You can specify the fields to be included, sorting orders, subtotaling, statistical functions, various report formats, and much more.

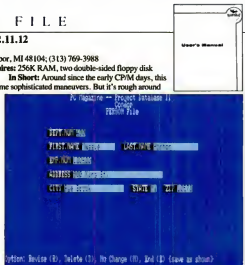
DateEase simplifies the process with an unusual interactive mode that displays every choice available at any given time in a horizontal choice menu. This makes it easy to learn the syntax of the query language; you can also type the required input directly with a simple built-in editor. The Full Report system adds many more language constructs for more-complex data manipulations.

DateEase's query language also has



FACT FILE

Condor 3, Version 2.11.12
 Condor Computer Corp.
 2051 S. State St., Ann Arbor, MI 48104; (313) 769-3988
List Price: \$650 **Requires:** 256K RAM, two double-sided floppy disk drives, DOS 2.0 or later. **In Short:** Around since the early CP/M days, this database manager does some sophisticated maneuvers. But it's rough around the edges, especially in its adaptation to the PC.
 Not copy protected.
CIRCLE 672 ON READER SERVICE CARD



This is a typical Condor 3 entry/editing screen—in this case for the Project Database Person file.

■ PROGRAMMABLE RELATIONAL DATABASES

several levels of sophistication. At the simplest level, it builds straightforward queries, which can use relational operators and wildcards for selecting records and choosing the fields to include. The language has a few high-level, procedural constructs (such as If/Then/Else), very flexible functions (including numbers to English, reversal of first-last-name order and other string manipulations, and financial functions as in spreadsheets), While/Do, For, Break, Exit and temporary variables. You can also define input data forms that solicit operator input from the keyboard.

DataEase has no sort or index commands per se. Any sorting or indexing is performed when you print a report. The sort is RAM-based, so the size of the data files that can be manipulated is limited more by available memory than by *DataEase*'s theoretical limitations (although we had no problems during PC Magazine Labs' tests).

OTHER PLUSES *DataEase*'s documentation is generally excellent, although the procedural language section needs some work. It took me several hours to de-

fine the Project Database reports, primarily because some aspects of the language were not explained completely.

While the language offers several powerful features, it is not quite a free-standing powerhouse à la *dBASE*. Rather complex reports can be programmed in a small fraction of the code required by *dBASE*, although you do sacrifice some flexibility. Both PC Labs test reports were executed reasonably quickly, especially considering that *DataEase* imbeds the sorts and indexes into the report output process.

There are too many other excellent features to be covered fully here. For example, an internal backup and restore system checks data integrity, data-import facilities are unusually flexible, and other functions allow building complete applications within *DataEase*.

DataEase operates smoothly and elegantly; its overall feel is fluid and responsive. Its high-level language isn't exactly my cup of tea (I'd like more control over record-by-record processing), but it's better than many others on the market. Overall, *DataEase* is an impressive and flexible program with much to offer both novice and sophisticated user.—Glenn Hart

DATASTORE:PRO

Datastore:pro from Software Connections is a relational database with a variety of good features and options that make it pleasant to use. This standalone system can be upgraded to *Datastore:Lan*—a multiuser system for a network environment. While a hard disk is recommended for the network system, it is essential in the standalone mode.


Installation of the system is straightforward and well documented. Tutorial sections in the manual together with sample files cover the basic uses of the database system, as well as the powerful *Datastore:report*—the output specification and printing system. I found the quality of the documentation provided acceptable.

You are guided through the program by a permanent four-line display of menus, option selections, status, instructions, and/or error messages. On-line help is available at all times through the F1 key (all option selection is with function keys F2 through F10).

The facilities that *Datastore:pro* offers through these menus and options parameters are impressive and include multifile relationships, multipage records, multiple index fields, multifield indexes, and field-oriented mathematical calculations. A lookup function brings data from one or more files into the current record being created or displayed for information purposes. Complex record selection is handled competently by a query language. Security features include password protection for data files and controlled access to records within files and fields within records.


DATABASE STRUCTURES Creation and specification of database structures are straightforward. You type input layouts on a blank screen with field lengths indicated by underline characters. Once you have finished that, you go on to the next screen that specifies index, key, "unique," and lookup fields (no facility exists for specifying required "must fill," forced upper case, or autoincrement fields). Field "pictures" for dates, dollar values, and so on, complete the file specification.


You add new records, browse through

**FACT FILE**

DataEase, Version 2.5
Software Solutions Inc.
12 Cambridge Dr., Trumbull, CT 06611; (203) 374-8000
List Price: \$600 Requires: 384K RAM, two disk drives, DOS 2.0 or later.
In Short: A highly flexible and operationally elegant database that uses its interactive mode to help users learn to take full advantage of the program's query language. Not copy protected.

CIRCLE 87 ON READER SERVICE CARD

**EDITOR'S CHOICE**



This DataEase consolidated database shows fields from all three Project Database files simultaneously.



FACT FILE

Datastore:pro, Version 3.2

Software Connections

2041 Mission College Blvd., Santa Clara, CA 95054; (408) 293-3400

List Price: \$495 Requires: 320K RAM, hard disk drive, DOS 2.0 or later.

In Short: Although this product offers an impressive array of file parameters, the lack of a sort function and the difficulty in moving data detract from its usefulness. Not copy protected.

CIRCLE 68 ON
READER SERVICE CARD

DATSTORE /am



A *Datastore:pro* database field definitions screen showing the criteria setup for an employee file with nine fields.

the file, or modify existing fields or records within a single add/browse option. Indexes for open files are kept current at all times by the program, and you can accomplish searches quickly and easily through the files based on single or multiple field contents.

Datastore:pro does not provide a sort function. To organize a file in a different physical sequence, you must create a new database with identical parameters and copy the old file across under the new index parameters. You must make any changes to field values and addition or deletion of fields in this manner. Each new file must be given a name different from the original. Records are in fixed-field format, and copy times are slow.

A join option allows you to merge selected data from one or more files for printing, display, or creation of a new database. The print and display options work well. However, when I tried to copy formatted fields to create a new database, they did not transfer correctly.

Importing data from other databases can require a two-stage process. You specify *Datastore* fields first to meet the non-formatted requirements of the incoming

data. You then copy this file to another, properly formatted *Datastore* database. Surprisingly, no facility exists within *Datastore:pro* to delete these duplicated files. Instead, you must delete files under DOS using the ERASE command.

PREPARING REPORTS *Datastore:pro*'s Extended Report Writer follows a series of logical steps to prepare a report. It first specifies files and selects fields and then displays a sample layout on-screen. This screen is used for the final layout design, which includes headers and footers, column positioning, break points established, and calculations specified. The finished product is then printed, and the report format can be stored for future use.

Some inconsistencies detract from the potential of *Datastore:report*. The manual wrongly states that report specifications can be stored and recalled for use as the basis for a different report. Also, changes to field format are not reflected in the output from a previously stored report. In both instances I found that the only solution was to respecify the report.

The overall performance and flexibility of *Datastore:pro* will satisfy the database

requirements of many business or private database system users. Although many of its file-handling facilities are awkward, it fits comfortably into the category (as defined by the manufacturer) of records management tool. The combination of flexibility and simplicity makes *Datastore:pro* an attractive relational database system for both the experienced and the inexperienced user.—Brian H. Stephens

dBASE II

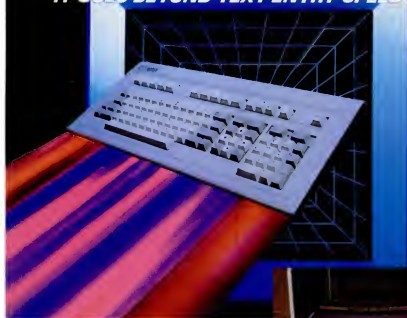
Ashton-Tate's *dBASE II* put microcomputer database management on the map. It's that simple. There were other contenders back in the early days of 8-bit CPM, 8080s, and Z-80s, but *dBASE II* simply blew them away. Through a combination of good performance, flexibility, creative marketing and advertising, and plain luck, Ashton-Tate earned a dominant market share that it hasn't relinquished.

dBASE II was converted to DOS when the PC appeared and has gone through a couple of revisions since, but the program has stayed essentially stable for some time. The *dBASE* language is almost identical to that introduced years ago. *dBASE III* and now *dBASE III Plus* have enhanced and expanded the language and the user interface significantly, but Ashton-Tate has wisely left *dBASE II* intact.

dBASE II reveals its ancestry clearly. The manual still uses the old CPM .CMD file extension, and MS-DOS changes are handled by an addendum. The program works with generic MS-DOS computers using serial video terminals, the IBM *Displaywriter*, and many other systems (several obsolete or out of business). A comprehensive Install process lets you change many system defaults and terminal characteristics, but it isn't needed for standard PC or compatible computers. Interestingly, *dBASE II* isn't copy protected. Why does Ashton-Tate believe *dBASE III* needs its annoying copy protection but *dBASE II* doesn't?

The manual still follows the two-part structure used since the early days. The first section is relatively friendly, while the second is a reference for more-advanced users. A reasonably good on-disk tutorial

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If for any reason you're not happy with RapidWriter, return the keyboard and software to us within 30 days, and we will refund the \$595.00 purchase price.

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to order or for further information
in Illinois 1-800-325-1850.

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DEALER INQUIRIES INVITED

CIRCLE 356 ON READER SERVICE CARD

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■ PROGRAMMABLE RELATIONAL DATABASES

is provided; it still uses CP/M syntax and doesn't take advantage of the PC's graphics (as the new *dBASE III* tutorials do), but it's not bad overall. When I think back on what *dBASE* users went through without it!

A FEW IMPROVEMENTS A few early problems have been corrected. The screen editor is still only partially a full-screen design, but at least it doesn't seem to mangle files as it used to. A couple of commands and functions have been upgraded slightly, but overall *dBASE II* remains pretty much as it was in the beginning.

Ashton-Tate includes several support programs. *dGEN* is a program generator that isn't totally competitive with third-party products but doesn't do too bad a job. *dSORT* is a freestanding sort routine capable of sorting up to 32 fields with any combination of ascending or descending order in either normal ASCII order or "phone book" order. You can run *dSORT* within *dBASE* with the Quit To command or directly from DOS. PC Magazine Labs tests showed that *dSORT* could sort our sample files on one key in only about 5 to 10 percent of the time required by *dBASE II*'s notoriously slow internal sort, and, of course, the internal sort can work only with one field at a time.

Programming *dBASE II* for the PC Labs tests was like putting on a comfortable old pair of shoes that had been hiding in the closet for a few years. The various niceties added to incarnations of *dBASE III*

■ **Programming *dBASE II*** was like putting on a comfortable old pair of shoes that had been hiding in the closet for years.

are missed by those of us who have upgraded, but not all that terribly. Performance doesn't match the newer generation of *dBASE III* versions (or the clone competition), but it's still not bad.



FACT FILE

dBASE II, Version 2.43

Ashton-Tate

20101 Hamilton Ave.; Torrance, CA 90502-1319; (213) 329-8000

List Price: \$295

Requires: 128K RAM, two disk drives, DOS 2.0 or later.

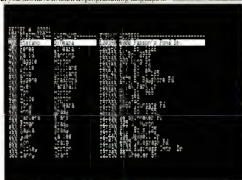
In Short: An old war-horse with lots of fight left, *dBASE II* can handle a tremendous range of tasks. But you still have to learn its programming language to make it show its form.

Not copy protected.

Circle's mail on

READER SERVICE CARD

The Project Database Person file creates a fairly typical, if somewhat simplistic, dBASE II report format. This is a simple browse; a more formal report can, of course, be programmed by the user.



Ashton-Tate

A TREMENDOUS RANGE It's tempting to evaluate *dBASE II* only in terms of its successors rather than as a product in its own right. If *dBASE III Plus* didn't exist, *dBASE II* would hold its own quite nicely, thank you. The flexibility that made it a star still impresses, albeit less so than the current offerings. Yes, you have to learn its programming language to get anything really serious done, the stark dot prompt still stares you unhelpfully in the face, the language has quirks, and all the rest. Nevertheless, *dBASE II* is capable of handling a tremendous range of tasks. Returning to the *dBASE II* womb points out the similarities with later versions more than the differences.

Why would you buy *dBASE II* when *III Plus* is around? A lot of *dBASE II* applications software has been written over the years, and Ashton-Tate is to be commended for continuing to offer and support *dBASE II* (consider the howls from 1-2-3 users when Lotus pulled Version 1A when Version 2 was released). If you're entering the *dBase* world afresh, go with *dBASE III Plus*, but it's comforting to know that an old horse with lots of spunk hasn't been sent to the glue factory yet. —**Glen Hart**

dBASE III PLUS

Ashton-Tate's *dBASE* family is unquestionably the market-share leader in micro-computer database management. Rather than stand still as dozens of competitors nip at its heels, Ashton-Tate recently introduced *dBASE III Plus*, an improved version of *dBase III* (almost all your *dBase III* programs should run under *Plus* with no modifications). A new user interface, local area network support, faster sorting and indexing, and over 50 new commands and functions greatly enhance this already powerful package.

For example, the Assist system introduced in *dBase III* is expanded and improved. Pull-down menus patterned on Ashton-Tate's integrated program *Framework* are used to perform almost any *Plus* option in an intuitive manner. You can now use Assist to perform multiple relational operations, a capability probably beyond beginners in previous versions.

NEW FEATURES There are so many new features that it's impossible to discuss them all here. New systems include a love-

■ PROGRAMMABLE RELATIONAL DATABASES

ly interactive Query, to build extraction criteria to filter records; Views, to set up relationships between files; Catalogs, to group files together and choose only relevant files; improved report generation; expanded debugging assistance; error trapping; and much more.

Screen design, previously a cumbersome process, is now fast and easy with a new screen painter. The painting feature creates both a special screen file that can be used as is and standard *dBase* code that you can modify. You can define up to 16 linked screens, which eliminates the need to cram many fields on one screen.

Ashton-Tate has obviously lavished great attention on the documentation, which now consists of two massive ring-bound volumes. They're generally well written, but a slew of correction pages were provided. Even the instructions for replacing erroneous pages had several errors, and scattered mistakes still remain throughout the documentation. Each command isn't given its own page in the reference section, which makes it annoyingly difficult to locate information or explanations quickly.

dBase III Plus includes both disk and manual tutorials. Color is used to good advantage, but the disk tutorial bombed at several points on my system—and inconsistently at that. The disk tutorial uses a simulation of the actual program, and not all the demos put everything in the same place as the real thing.

IMPORTING TEST FILES I had no difficulty importing the Project Database test files. *dBase III Plus*'s report generator can access more than one file, but the structure of the test files did not allow linking all three data files by one common field. This structure was beyond the report generator, so I had to program both test reports in the *dBase* language. The algorithm I used incorporated sorting and indexing within the report, always a good idea to assure up-to-date input, but not necessarily the fastest method. This approach is viable because of the very high speed of the *Plus* sorting and indexing routines. My programming chores were greatly aided by *dBase III Plus*'s new interactive debugging commands, which store command histories, single-step through program ex-

ecution, suspend operation for checking variable values, and more.

dBase III Plus now includes RunTime+ utilities that encrypt program files. RunTime+ is usually used by software developers to distribute programs without providing source code. Ashton-Tate also threw in an Advanced Applications Generator program, which at first seems similar to third-party program generators like QuickCode or FlashCode. In reality, the program is a very primitive menu-generating program that creates an almost useless data management system.

LAN ADDITION The addition of local-area network facilities may be the most important *Plus* enhancement to many users. IBM PC Networks and Novell Advanced Netware/86 are supported. Commands are included for locking files and individual records to prevent simultaneous access by more than one user. These commands are not as sophisticated as those in some other multiuser database management systems, but they look like they can do the job.


dBase III Plus is, at the same time, both easier to use and more powerful than its an-

cestors. It is a heavyweight package that can serve the needs of both relatively unsophisticated users and programmers and software developers. And all the new features have been added without any increase in price! Even putting aside the benefits of going with the market leader, *dBase III Plus* remains the database manager of choice for a wide spectrum of microcomputerists. —Glenn Hart

DDQUERY

DDQuery is a heavyweight. Its heritage is heavyweight, its price is heavyweight, and, in many respects, its performance is heavyweight, too. *DDQuery* was developed on mainframe computers some 20 years ago and was first ported to the PC environment in 1982. At \$3,750, it's one of the most expensive database managers available for desktop systems and makes you wonder if its performance can measure up to such a pedigree.

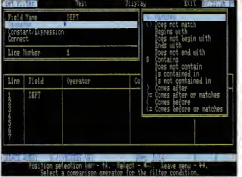
DDQuery's executable file is huge, at

**FACT FILE**

EDITOR'S CHOICE

LEARNING AND USING
dBASE III PLUS

dBASE III Plus, Version 1.0
Ashton-Tate
20101 Hamilton Ave., Torrance, CA 90502-1319; (213) 329-8000; (213) 558-0086
List Price: \$695 **Requires:** 256K RAM, two disk drives, PC DOS: 2.0 or later, MS DOS: 2.1 or later. **In Short:** A new, improved version of Ashton-Tate's marketplace leader *dBase III* that includes several modifications to aid the less-experienced user. Copy protected.
CIRCLE 66 ON READER SERVICE CARD



dBASE III Plus's interactive Query System illustrates windows, pull-down menus, and the very flexible options available.

For more information on this software, call 800-451-5273. You can also write to: PC Magazine, 1155 Avenue of the Americas, New York, NY 10020. Select a comparison operation for the filter condition.



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■ PROGRAMMABLE RELATIONAL DATABASES

over 500K bytes, so you must concatenate two separate files together with the Copy command, but otherwise you don't have to use any type of install program with *DDQuery*. It's not copy protected.

NOT FOR THE INEXPERIENCED

Your next hint that *DDQuery* isn't your basic Christmas card manager is the documentation. On the very first page, it indicates that setting up databases is the job of the Data Base Administrator. This isn't all that unusual in the large computer environment, but it clearly indicates that the structuring of *DDQuery* databases and applications isn't for the inexperienced. The three books of documentation are factual but also dry and somewhat unhelpful. There's no tutorial to help you learn the system, but the manuals are adequate once you know your way around.

You can choose many *DDQuery* options from a single menu, but it's more an add-on than the central focus of the system. You normally type commands at a naked exclamation point prompt. Single- or double-letter abbreviations are accepted, and the syntax is rather straightforward once you catch on.

Databases are structured with a Schema Processor that has its own database description language. You define multiple files as part of one centralized database; each individual file with a common definition is called a dataset. Datasets can be either Masters or Details, based on access method and the relationship between the various fields. Detailed security provisions control read and write access to stored data.

Eight utility programs are provided for you to create and maintain databases. You can create or reinitialize datasets, load or unload data, list information on items, forms, and sets, and so on. Several of these utilities output somewhat cryptic but detailed tabular charts that are quite informative once understood.

A LINE-ORIENTED EDITOR You can create reports with either *DDQuery*'s report generator or its high-level TRANSACT language. Both employ a line-oriented editor that's a throwback to the editors I used 15 or 20 years ago. It's a far cry from the full-screen, superflexible editors we're all used to today, but it gets the job done today as its ancestors did back then. Both the

report generator and TRANSACT are flexible and powerful, although their syntax is terse and the BASIC-like line-numbering system seems primitive.

The relatively simple reports required for Project Database didn't really make full use of some of *DDQuery*'s capabilities. For example, *DDQuery* can simultaneously sort up to nine files on up to seven keys and performs virtual joins of multiple files in a manner uncommon to microcomputer data managers. File blocking can be optimized for maximum storage efficiency. The system has always been multiuser oriented, and it currently works with several local area networks.

There are some rough edges, though. For some reason, *DDQuery* dropped the first record of all three Project Database data files when I imported them into the system (I added them manually so the data would be complete). A character is dropped from the program's screen prompts in its add mode, and the first line of each page of one of the test reports was offset by a character. There are a few non-critical typos in the manuals.

DDQuery was quite slow in importing the test data and in some other disk operations. The various files it created occupied more disk space than most database files do; a hard disk is a necessity. I needed some assistance from the unusually helpful support staff in creating the sample reports, but once programmed they executed smoothly. Execution time was speedy, but not overwhelmingly so; *DDQuery* accessed the data disk more than some other programs, and perhaps its disk routines slowed processing somewhat. *DDQuery* must perform a virtual join prior to running the reports for the first time, and if the time this takes is added into the report timings, they are less impressive.

DDQuery can build microcomputer applications that previously might have required a mainframe or minicomputer, and it does so using very much the same methods. It is far from friendly compared with most other microcomputer DBMs, but its trade-off is unusual power. I don't think most PC users will find *DDQuery*'s price/performance ratio worthwhile, but a small segment of data managers stretching the limits of what micros can do may find it attractive. —M. David Stone



FACT FILE

DDQuery, Version 3.1

Venet-Ulym Inc.

7430 E. Coley Ave.; Englewood, CO 80111; (303) 773-1894

List Price: \$3,750 **Requires:** 384K RAM, hard disk drive, DOS 2.0 or later

In Short: This rather expensive database product packs an unusual amount of power contained in eight utility products. Unfortunately, this plus

offset by the program's awkwardness and pedestrian speed. Not copy protected.

CIRCLE 62 ON READER SERVICE CARD

The main menu from which many *DDQuery* commands can be issued. Note the bit of self-advertising inserted under the title.



ENABLE

A great fear many users have when considering an integrated package is that the individual components won't perform as well as dedicated programs would and that quality has been sacrificed for convenience.

With *Enable*, you don't have to worry about that. The *Enable* database manager includes strong relational capabilities and a procedural language, and it ranks with some of the best standalone programs. It is well designed, easy to use, generally quite fast, and only occasionally quirky. The only major problem I had was that the manual does not do the advanced features of the program justice.

USEFUL EXTRAS Since *Enable*'s database manager is good enough to stand on its own, integration with a word processor, spreadsheet, and telecommunications is icing on the cake. You can use database records for mail-merging, to copy part of a database display into a word processing text, or to move selected database records into a spreadsheet for more-detailed analysis and graphics. Many of the spreadsheet math functions are also available for use in database reporting.

The help information in *Enable* is exceptional. At almost every step of the way, information appears on the screen (often boxed at the bottom) to guide you through the steps. The F1 key triggers even more help.

Enable always seems to offer at least two ways of doing everything. Database definition is a good example of this. You can choose a quick method, in which you simply indicate through menus the type of data and the length of each field. Or you can go the detailed route, also through menus, to specify indexing, range testing, error messages during data input, derivation of the field from another file, and so forth. This I liked.

DEFINING REPORTS The sailing was not as smooth, however, as I took *Enable*'s database manager through the report definition part of the PC Magazine Labs testing script.

You can define an *Enable* report in one



FACT FILE

Enable, Version 1.10

The Software Group

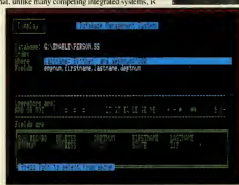
Northway Ten Executive Park, Ballston Lake, NY 12019; (518) 877-8600

List Price: \$695 Requires: 256K RAM, two disk drives, DOS 2.0 or later.

In Short: A well-structured, if slightly flawed, integrated package with a relational database manager that, unlike many competing integrated systems, is strong enough to stand on its own. Not copy protected.

CIRCLE 878 IN READER SERVICE CARD

This *Enable* screen lets you select records for display. The information at the bottom of the screen shows what information is allowed for each screen entry.



of three ways. The first is as a simple columnar report. If your file is not sorted, the columnar report can sort on any one indexed field of the file. For sorting on more than one field, you must create a sorted "select set" file through the sort menu. This select set is actually just a file of pointers to the original database. If you use the select set file for your report, you cannot do additional sorting when generating the report. This restriction seemed to me a nuisance because in typical business applications reports are almost always sorted on at least two fields, and multiple reports sorted in different ways are often required from the same file.

The second method of report definition is through screen painting (called "put it here" in the *Enable* manual). This is really best for form generation. If you display a put-it-here report on the screen, you only get one record per screen, even if you specify that the record occupies only a single line.

The third method of report generation is through the *Enable* DBMS Report Language, which includes If-Then-Else logic, procedures, gotos, and much more, all done with dot commands in a word pro-

cessing document. Unfortunately, the manual devotes only 14 pages to Report Language syntax, concluding with a large example. It's enough information to get you started but doesn't reveal the full power of the language. It's not always apparent from the syntax that the procedural language has real looping and control flow. Perhaps it's the type of thing that a nonprogrammer would have an easier time with. But it really stumped me for awhile and was the only time during my database testing that I required real tech support. (The Software Group plans to introduce a *Power User's Tool Kit* at no cost to *Enable* subscribers and low cost to registered users. The 30 additional pages on DBMS programming in the *Kit*'s new manual could have helped me out here.)

With some software manufacturers, you get the impression that they believe their job is done when the product hits the stores. However, I got a strong sense from The Software Group that it is listening closely to feedback, actively supplementing the documentation, and providing extra material where it is needed. This makes *Enable* a good investment for now and the future. —Charles Petzold

■ PROGRAMMABLE RELATIONAL DATABASES

FILEPRO 16 PLUS

FilePro 16 Plus is a feature-rich package for the applications developer or technical end user. However, I wouldn't recommend this product for the novice computer user selecting a DBMS for the first time. It is simply too much to deal with.

The *filePro 16* package is a modernized version of the old *Profile* system sold through the Radio Shack chain for the TRSDOS computers. With the advent of the Xenix machines, it was upgraded to 16-bit internals, and the name was transposed to *filePro*. My test version is the *Plus* upgrade to the earlier *filePro 16*, which extends record sizes and numbers significantly. It still shows the remains of its early heritage, however, as the system spins the A: drive on every program load, even though the entire thing is loaded on hard drive C:

You get a quick feel for a software product when you first open the box. In this case, the box contains six disks, a large reference manual (*filePro 16*), a 300-page addendum (upgrading *filePro 16* to *filePro 16 Plus*), a "Quick Reference Card" that is actually a 30-page book, several blue errata sheets, a bound installation manual (over 100 pages long), and a tutorial manual of similar size. The amount of material is almost overwhelming, and it is difficult to decide where to start reading.

GETTING STARTED When you finally get started and load the first disk, the actual process of getting *filePro* on your hard disk is deceptively simple. Nice touches include automatic modifications to the CONFIG.SYS file for the required FILES=20 and BUFFERS=30, as well as the DEVICE=ANSI.SYS entry. If your system is configured for less than this, the changes are made for you as the install process completes itself. Loading is straightforward and simple, and there is no copy protection scheme to deal with either. The screen prompts don't quite agree with the manual, but it is easy to follow along.

If you like a clean, organized hard disk, *filePro 16 Plus* will cause you to grumble. Just loading the disks added ten subdirectories to my hard drive and threw a handful of miscellaneous files into the root directory

for good measure. A lot of the data is used in the tutorial, but this system spawns new subdirectories every time you create a new file.

filePro 16 Plus is clearly UNIX-based in its design, and the documentation is filled with UNIX/Xenix notation that will cause giant headaches for the typical PC user. The manual gives this as a sample of a properly completed command:

```
/fp/report Person1 -f
dprinter -12 -h
"Print Department Roster"
```

On the positive side, in this case complexity relates to flexibility, and the options available to the designer or programmer are considerable. You could add many more "switches and flags" to the syntax if you felt like it. But compared with today's new products that stress ease of use, *filePro 16 Plus* appears terse and rigid.


The manuals are equally so, and the mixture of single-user and multiuser syntax is confusing. You have to jump back and forth between the main manual and the addendum frequently, and the examples fall short of really showing you how to do the thing you are looking for.

filePro is menu driven, using moving-bar menus for ease and speed. The steps required to define a new database are relatively simple, and the process will generate default entry screens and reports automatically. To create your custom screens, a painter is provided, and all that is required is cursor movement and typing to get what you want.


PROCEDURAL LANGUAGE The procedural language facility leaves much to be desired. The procedures are entered on a very busy screen filled with dotted lines, and references to database fields are strictly by field number. This technique was old years ago. A sort of pseudo-BASIC syntax is used, and when compared with modern language such as that found in *dBASE* procedures, *filePro* suffers in the comparison.

This system employs fixed-format records and allocates disk space for a specified number of records in each file. Utility programs are provided to enlarge overflowing files and to create the indexes that support retrieval. These functions zip along quickly (at the 500-record volume level for this test).

Scanning retrieval of records causes a




FACT FILE



filePro 16 Plus, Version 02.00.00
 The Small Computer Company
 40 West Ridgewood Ave., Ridgewood, NJ 07450; (800) 847-4740 (sales)
 230 W. 41st St., New York, NY 10036; (212) 398-9290 (service)
List Price: \$990 single user; \$1,990 multiuser **Requires:** 256K RAM, two disk drives, DOS 2.10 or later **In Short:** A UNIX-based, flexible product

GETTING STARTED
 READ THE SERVICE CARD

The Define Files screen handles the creation of filePro 16 Plus's file structure prior to loading the Person data.



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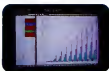
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- Extremely easy to learn and use
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—Michael D. Bowe, DATA GENERAL

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—Robert Lawrence, ITT INFORMATION SYSTEMS



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- **System Requirements:** IBM PC or compatibles, 512K, two 360K diskette drives, color or mono display
- Twenty-four hour Hotline Support (optional)

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■ PROGRAMMABLE RELATIONAL DATABASES

scan of the entire allocated file space, even when unused. This is extremely inefficient in an application where file sizes tend to be dynamic over time.

Context-sensitive help is not provided, nor is there any use of windowing in *filePro*. I would expect to find these features in a DBMS product that sells in the \$900-plus range. Tech help from the vendor is also light. I spent 4 hours trying to figure out how to import the sample test files into a *filePro* database before giving up and calling tech service in New York City. Response time for a return call from the New York service number was over 2 hours, and when I tried to call in at 4:15 p.m., neither the (800) sales number nor the (212) service line answered at all.

filePro 16 Plus works and is reasonably fast, but it is way too complicated and seriously overpriced for today's market.


—John Phillips

GOLDDATABASE

Using *GOLDDATABASE* is fun. This is a great DBMS for a first-time user and should help the novice get over the shakes that come with "going database." Though it isn't the proper tool for a power user, it is perfectly packaged for the less-demanding PC user.

Nothing about this package is intimidating. You get one small manual, two software disks, one tutorial disk, and that's it. Create a dictionary, load in the two disks, then type *GOLDDATA*, and you are off and running: no key disk, no copy protection, no special commands in *CONFIG.SYS*, no *ANSI.SYS* driver required, no math chip, no expanded memory. When you have installed the software on your hard disk, it sits in 20 files in one sub-directory, occupying just over 650K bytes. Compared with some of the monsters in this project, that is downright nice!

The documentation package for *GOLDDATABASE* is modest: a one-volume, 170-page manual with dividers. The material is attractively typeset and contains enough misspelled words to make the reader smile. I would like to see better, more complete examples for some of the functions, since the details are not sufficient for




FACT FILE

GOLDDATABASE, Version 6.0
Goldata Computer Services Inc.
2 Bryn Mawr Ave.; Bryn Mawr, PA 19010; (800) 432-3267; (215) 525-1936
List Price: Single-user system, \$595; four-user LAN, \$1,487.50
Requires: 192K RAM; one disk drive; DOS 2.0 or later.
In Short: Ease of use, complete on-screen help facilities, and helpful technical assistance make *GOLDDATABASE* an excellent choice for the novice user. Not copy protected.

CIRCLE 694 ON READER SERVICE CARD

GOLDDATABASE's Entry/Inquiry screen illustrates the program's unobtrusive but helpful on-screen format. The program is about to sort on the last-name field.



the entry-level user in some areas.

If you run into difficulty, just call the hot-line number, and you will find a thoroughly competent technician ready to help you out. Goldata Computer Services is a small company that is strong on technical matters. Of all the hot lines I have called in my excessively long career, I found this one to be among the best.

The first time you bring up the system, a configurator module is called to tailor the package to your likes and hardware setup. Every item is explained on-screen, and the process only takes a few minutes. You can set up for Beep on errors and one-touch menu control (eliminating the need to hit Return after picking a menu item) as well as default drive/directory and color usage. I had a bit of trouble setting the color, but it finally worked; and once you set it, it appears on every screen and menu.

GOLDDATABASE offers just the right level of help to the user in trouble. On-screen help is never intrusive—it's just there when you want it—always context-sensitive and able to display available choices (file names, procedures, report forms) at the touch of a key. I have seen slicker, faster help in other systems, but

this one is very effective. Whenever possible, help choices are presented Lotus-fashion, with horizontal highlighted blocks either across the top of the screen or across the bottom.

CREATING A DATABASE You create a database by just drawing it on the screen using the full-screen editor built into *GOLDDATABASE*. In one easy step, you have defined a database structure and created a working format for display/entry/update of records in that database. It took me less than 15 minutes to create the three test databases used by this project. The system does some unexpectedly good editing in the process. For example, I found that in building the display screen for the Person database, I couldn't specify a table verification on department number because I hadn't yet defined the Department table.

Once you have defined the database, entering new records is just a case of "filling in the form" on the screen. It's quick, easy, and smooth in operation. I found one unusual (and annoying) quirk in data entry mode: there is no rollover to the next field or warning beep for overflow characters. It just keeps entering them in the right-most

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— Exasperated 1:16

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■ PROGRAMMABLE RELATIONAL DATABASES

position of the field without warning, one on top of another.

This system is DOS 2.10 (or later) compatible but is restricted in accessing files since the program does not allow you to specify a file extension in most cases. I was unable to import the *PC Magazine* test files until I renamed the files with a .TXT extension. There is no reason for this type of limitation in any reasonably planned database package.

IMPORTING FILES Once past the naming problem, importing the test files was a snap, but very slow. I averaged about 5 minutes per 100 records during the import process, not a good sign for business users. My hot-line contact tells me a new release of the system provides an I/O speed import function if you are willing to bypass the normal field edits.

The import program generated databases that were just slightly larger than the raw data from the *PC Magazine* files. I specified several index keys and found that the key file for the Person database was 37K bytes in size (the main data file is only 47K). You are not limited in the number of index keys, but there is a penalty in disk space (and execute time when altering index values).

The *GOLDATABASE* system is written in compiled BASIC, with some assembler routines. Considering this, I think it is surprisingly fast. A "Find" through the entire test file of 500 records took only 18 seconds, and an alphanumeric sort of the file on a 20-character field ran 2 minutes, 20 seconds—not a runaway winner, but quite fast enough for the normal PC user.

There isn't a true procedural language for *GOLDATABASE*, but there is a BASIC language interface that allows you to use BASIC, with *GOLDATABASE* as a callable database manager. While this extra cost option was not part of this project, it should make a logical growth step for the initial user of *GOLDATABASE*.

I like this product. Most of my preferred software is much more powerful than this package, but in *GOLDATABASE* everything seems to come together so smoothly and simply. It's a winner for the entry-level user who needs multiple power, a good screen painter, and a direct linkage to BASIC.—John Phillips

INFORMIX-SQL

Relational Database Systems' *Informix-SQL* is an updated version of the older *Informix*, Version 3.2, with some real advances and even more speed. It has added a procedural language and some nice touches like linking you to your favorite word processor whenever text chores are at hand.


The documentation includes both a user guide and a more technical reference manual. It's filled with a large variety of examples and further bolstered by appendices containing more sample code listings—a good thing because the *-SQL* release needs a lot of pages to explain its varied features.

Installing *Informix-SQL* isn't hard, but it takes a long time, and you'd better load it into an \INFORMIX subdirectory on your hard drive, although you can place it somewhere else. (I learned the hard way that the built-in demo program won't work until the primary files are loaded into \INFORMIX.) The actual installation from the four disks takes almost 15 minutes, with no indication on your CRT as to what is happening. The install procedure then "brands"

the main files based on a security key that is tied to the RDS serial number.

The *-SQL* package employs 1-2-3-like bar menus across the top of the screen and a new database directory structure. A utility program (DBCONVERT) is supplied to translate older *Informix* applications to the *Informix-SQL* environment. Directory structure, filenames, and standards for handling date and money fields are just some of the changes.

I had trouble testing this package. Everything that works, works well and faster than any other system I have tested. But some things don't work at all, though RDS is known for quality products. For example, when I attempted to load the demo system from anywhere other than the \INFORMIX subdirectory, it failed to locate the proper files even after setting the \INFORMIXDIR environmental variable. I reinstalled the whole thing into \INFORMIX and tried again. The demo files were copied without difficulty, but the demo installation bombed with a cryptic message, "LOAD LINE 1: Error in line 39." A FORMBUILD procedure that follows this failed with "5 errors" on each of two different screen files.


**FACT FILE**

Informix-SQL, Version 1.10.05

Relational Database Systems, Inc.
2471 E. Bayshore Rd., #600; Palo Alto, CA 94303; (415) 322-4100;
(414) 424-1300
List Price: \$795 **Requires:** 512K RAM, hard disk drive, DOS 2.1 or later.
In Short: An extremely fast if somewhat confusing database with powerful procedural language and report functions. Not copy protected.

CIRCLE 666 ON READER SERVICE CARD

You can use the built-in Informix-SQL editor if you wish, but all you get is one screen full and no power commands. Then the compiler fails with "syntax error," and you get no help at all regarding what is wrong or where!



Informix-SQL

Relational Database Management System

MSQL: New Run [] Use-editor [] Output [] Save [] Choose [] Info [] Exit
Modify the current MSQL statements using the MSQL editor.

PC2825 Press CTRL-H for Help

```
create table person (
  name      char(20),
  name      char(15),
  name      char(15),
  name      char(15),
  address   char(60),
  city      char(20),
  state     char(2),
  zip       char(5); )
```

(This is the entered structure definition for the PERSON test file. Note primitive CTRL commands at top. Display is how all others, and this screen editor flashes colored snow at every stroke.)

MSQL: Informix-SQL Database Manager

TERSE INTERFACE Once I got into the main system, I found a terseness in the interface that is really out of step with the times. The entire system is in black and white with no apparent option to configure the displays for color. What on-screen help is available is brief almost to the point of uselessness. If you fall into a procedure by accident, you can't always escape without going through several more steps. You also have to use arcane key combinations like Ctrl-W to get what on-screen help is there, and Alt-A and Alt-D in the text editor instead of the Ins and Del keys (which I found *do* work, even though the manual doesn't tell you that).

This system is a direct port from the UNIX/Xenix operating environment, and not enough work has been done to package it for the PC marketplace. When I talked with RDS service in Menlo Park, I was told that one individual specializes in supporting the IBM PC product. While RDS claims to have sold 3,500 copies of the *-SQL* release, the company's focus is clearly on the UNIX marketplace, not on DOS. For example, *Informix-SQL* can't import a standard, comma-delimited ASCII file. It will not deal with the surrounding quotation marks on alphanumeric fields, and as a result I could not properly load the test files.

Problems notwithstanding, *Informix-SQL* is fast. Its execution speed for index maintenance, record retrieval, and report generation are definitely above the norm. *Informix-SQL* generates and compiles code segments for each function you define and gains a tremendous speed advantage over its interpretive and pseudocompiled competitors.

PROCEDURAL POWER When I tested *Informix*, Version 3.11, for the original *PC Magazine* Project: Database, my major complaint was its lack of a procedural language. This new release covers that quite nicely. The RDSQL language syntax is very powerful but does take a bit of experience to use effectively. Considerable power has been added to the PERFORM transaction processor, and the ACE report writer is truly a programming language in itself that can be used for the preparation of more-complex reports. Without moving into the ACE environment, you can make



FACT FILE

KnowledgeMan, Version 2.0

Micro Data Base Systems Inc.

P.O. Box 248; Lafayette, IN 47902; (317) 463-4561

List Price: \$525 Requires: 320K RAM, two disk drives, DOS 2.0 or later.

In Short: An integrated system that uses its query language to establish efficient links between data files. KnowledgeMan is really meant for the experienced power user. Not copy protected.

CIRCLE 887 ON READER SERVICE CARD



KnowledgeMan leaves an audit trail of window prompts on the top of the screen while, at the bottom, it executes a command that will find the record for "Bitner."

STAN JEFFERSON FOR LINUX = "SELECT" AND NET/30 = "30"

< - Up Ent - Enter Response
 > - Down Esc - Previous Menu
 ? - Is to Top PC - Main Menu
 / - Enter Exit Help

up meaningful formatted reports that include multifile lookups, headings, and computations on detail lines and at control breaks. If that isn't enough, ACE can do almost anything you could imagine.

I found the older version easier to learn and use than the *-SQL* release. The new menu structure is so confusing that I got lost more than once. The directory structure is confusing also: the system doesn't always put things where you expect to find them, and the linkage to your word processor occasionally drops items into the wrong directory. Finally, several of the examples in the manual contain missing punctuation that is critical to the system; if you key in just what you read in the book, you get that damnable "syntax error" message for your efforts. This type of problem is easily correctable and totally unnecessary, especially in such a complex product.

Still, this is a true power system for a power user. It would scare the skin off a novice, but, if you can handle it, *Informix-SQL* is built for movement in the fast lane, and it eats large files faster than any other DBMS I have used on a PC.

—John Phillips

KNOWLEDGEMAN

KnowledgeMan, Version 2.0, is a product of Micro Data Base Systems Inc., a company with an excellent reputation in database systems for minis and mainframes. Called *KnowledgeMan/2*, or *KMan/2*, this powerful relational database manager is part of an integrated system that is made up of options including a full-featured word processor, a communications package, a business graphics package, a forms painter, a report painter, and a mouse driver. Other modules include K-C, a library of special functions that enable the user to define and manipulate *KMan/2* data tables from within C programs; LAN versions of *KMan/2* that permit sharing of resources by multiple users on Novell, 3Com, and IBM PC networks; an interface that enables the user to carry on natural-language conversation with *KMan/2*; and various run-time packages available at negotiated prices. An interface system between *KMan/2* and the company's popular post-relational system MDBSIII is available.

The base *KMan/2* module includes the relational database system, an SQL/DS-

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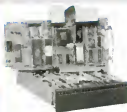
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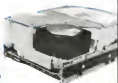
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■ PROGRAMMABLE RELATIONAL DATABASES

like query language, a full-featured 255 by 255 spreadsheet, and a sophisticated structured programming language. The package I reviewed comprised the base modules and K-Print, K-Report, and K-Text.

QUERY LANGUAGE LINKS *KMan/2* takes a unique approach to handling data. As in any relational database, *KMan/2* keeps records in flat tables of columns and rows. Tables are related to one another by common fields; for example, a file of employees and a file of salaries have employee number as a common field. However, unlike most relational systems, *KMan/2* does not maintain a hard record of links between tables. Rather, you establish links with the query language when you request data output. This means there are no requirements for the maintenance of data dictionaries, and, since there are no practical limits on files being open simultaneously or on active index files, no limits exist on the way files are strung together to create custom databases. There are, however, user-imposed limits that have to do with the ease of handling queries. More than four simultaneously open tables becomes unwieldy.

KMan/2 offers overlaying, dynamic menus that lead the beginner through operations step by step. However, the package is really designed for the applications programmer, and commands for *KMan/2* are usually entered at a prompt in its interactive mode or from a "perform" file in its batch mode.

KMan/2's real strength as an applications development system is its wealth of arithmetic and string-handling functions. All trig functions, many statistical functions, and the string-manipulation functions of advanced languages are included. *KMan/2*'s internal language is similar to Pascal's flow and control structures. Variables can be local to procedures, arguments can be passed, and procedures themselves can be kept on disk or read into memory before processing.

A powerful macro system is available to shorten code in repetitive tasks or to rewrite the entire command language.

TWO-DIMENSIONAL ARRAYS *KMan/2* recognizes four classes of variables: working, field, cell, and system.

The working variables, limited only by memory, can stand for any constant or expression and can be global or local. Two-dimensional arrays are supported. Field variables are actually the contents of the field of the current record in the active table(s). Cell variables are the values in the

■ The question with *KMan/2* is never "Can it do this job?" but "How can I get it to do this job?"

current spreadsheet, and system variables—environment or utility—control the *KMan/2* environment and report on the status of operations.

K-Print and K-Report are somewhat better for on-screen forms and report generation than bare-knuckled programming (which is entirely possible with this product), but not much else. Both of these utilities need work. K-Text is a good line editor, but since *KMan/2* allows you to call any other program from within the *KMan/2* environment—including, if you wish, your favorite word processor—it isn't really necessary.

Despite overtures to the casual user with its step-through menus and 50K bytes of context-sensitive help, *KMan/2* is an applications development system for the professional or semiprofessional user. The question with *KMan/2* is never "Can it do this job?" but rather "How can I get it to do this job?" Sometimes this program can be downright user-hostile, but like a well-trained tiger, it can do amazing things in competent hands.—Richard Aaron

MAINSTAY

Mainstay is full of puzzles. It is uncommonly adept at tackling some common and difficult problems faced by many business people, and in many ways accessing this power is made easy. On the other hand, *Mainstay* has some holes, which you

should consider carefully when evaluating the package.

The first thing you'll probably notice about *Mainstay* is the documentation. Without its pair of slipcases, it still weighs in at a professional 11 pounds. Four separate binders make up the documentation: *User's Guide*, *Application Development Guide*, and a two-volume *Reference Manual*. There is more to user manuals than mass, however. It's like the story about two customers overheard in a restaurant. The first one said, "The food isn't very good here, is it?" to which her companion answered, "No, but they do give such nice, large portions!"

Mainstay is probably the champion candidate for my "Goto Award" for documentation. It is fairly well indexed, and the sections refer you to different sections (or manuals) clearly, but I found that I was often leafing through all four books at once, struggling to keep my place in one while looking up the cited reference section in another. Another part of the problem was that many complex issues are discussed only briefly, and the few examples provided are not always thoroughly explained.

INTERESTING REWARDS While there's plenty to learn, the rewards appear to be significant. This program is designed primarily to handle data where the elements can be arranged in a matrix, such as time series or ranges of items. You may have a manufacturing problem, for example, where you need to track actual and budget costs and sales for a number of products over a period of months. *Mainstay* makes it simple for you to look at actual sales for a given product over time, the costs for all products in one period of time, the actual-versus-budget figures for all products in one time period, and so forth.

Instead of referring to fields in a table, *Mainstay* refers to "variables" and "dimensions." You will probably need some time to catch on to how *Mainstay* wants to organize your data.

The program can also link different tables. The linking can be done interactively at the command level or through procedure files. Writing procedure files is made easier because *Mainstay* has a built-in text editor that can do block copy and move functions, as well as some other nice features.



FACT FILE

Mainstay, Version 2.53

Mainstay Software Co.

1745 Stout St., #201, Denver, CO 80202; (303) 298-8961

List Price: \$1,495 Requires: 512K RAM, hard disk, DOS 2.0 or later.

In Short: A multidimensional powerhouse, *Mainstay* offers many rewards, including a set of utilities that allows an applications developer to customize just

about everything; but you'll probably need plenty of study before you get at all its power. Copy protected.

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Mainstay uses a dictionary to hold definitions of all fields. The listing at the top of the screen describes the fields that define the matrix dimensions for each table.

Field List

DEFINITIONS FOR DATABASE: jones

Dimension	Size	Name	Title
dept	5	deptnum	
employee	500	empno.n	
salary	500	salnum.n	

Variable	Dimensions Used	Data Type	Is Title	Title
add	employee	CHAR 30		Address
chda	salary	INTEGER		Change Day
chmo	salary	INTEGER		Change Month
chyr	salary	INTEGER		Change Year
city	employee	CHAR 30		City
costctr	dept	CHAR 5		Cost Center
curda	salary	REAL		Current Salary
deptname	dept	CHAR 15		Department Name
empno	employee	CHAR 5		Emp No
empnum	dept	CHAR 5		Department Code
empno	employee	CHAR 5		Employee Code
empnum	salary	CHAR 5		Employee Number
total		REAL		Total

User Guide

mainstay

either the keyboard or a file and \$Fileout to route output to the screen, a printer, or a file.

While the program can import either fixed-length or variable, delimited records, both procedures have some idiosyncracies. The fixed-length record import is fairly straightforward, except that you must write a procedure file to use it. The variable-length import is more difficult because it expects to find all the values for the first field first, then all the values for the second field, and so on. This is fine if you have complete control over the production of the import file (and have the time to exercise that control), but in many cases the fixed-length option will be the only viable choice.

RESTRICTED MODIFICATIONS

Mainstay puts severe restrictions on the types of modifications you can make on a database. You can add to a dimension size (in effect, adding record capacity), but you cannot reduce it. You cannot modify anything but the title of a field (called a variable). If you want to change its size or the dimensions it is assigned to, you need to go through a four-step procedure that actually copies the data from one variable to another. Other programs make this important task somewhat easier to perform than does *Mainstay*.

If you have applications that require extensive analysis of time-series data or have similar matrix-oriented problems and don't object to a copy-protected program, *Mainstay* may have a lot to offer. It is quite different in philosophy and design from most other products, however; so be prepared for plenty of study and probably some coding before you get at all the power and the rewards this product has to offer. —Alfred Poor

At the command level, the standard DOS editing functions are available, and so you can use F1 and F3 to repeat the last command should you make an error or wish to modify the last instruction.

A SIGNIFICANT RANGE Perhaps the most interesting detail of *Mainstay* is its open-armed support of value-added retailers and others who need a package as the basis for applications products. *Mainstay* includes a set of utilities that allows a developer to change just about everything, from the opening logo to the command-level prompt. You can switch off the interactive mode so that the program becomes a run-time package. The *Application Development Guide* includes helpful advice on how to analyze and structure a development project, write the code, and then troubleshoot the results. Two brief case studies are even available to give you some idea of ways to use *Mainstay*.

The procedural language has some nice features, including a command called Range Select, which displays a list of choices on the screen, and you select your choice by pointing with the cursor and pressing Enter. This makes data entry from

a list of choices as easy as a menu selection. You can code this in *dBASE* or some other program, but here it is built-in. Also built-in are more than 75 different functions, including extensive date, financial, and statistical operations.

Not everything is built-in, however. *Mainstay* has a forms painter, which works quite nicely, including one of the better ways of setting field parameters that I have seen. The problem is that the generated forms do almost nothing from the command level; you must write some pretty complex code to make them useful. As a programmer's aid, the paint program is a help, but as a user-friendly feature, it is a bust.

IDIOSYNCRATIC PROCEDURES The multidimensional queries are powerful, but the concepts and the language take some getting used to before you can produce the results you need. The procedure language itself uses a structure similar to other products, but the syntax and choice of commands and vocabulary may be a bit confusing to those familiar with other approaches. For example, you use the \$Filein command to set the input source to

METAFILE

Metafile isn't a perfect program, nor at \$995 is it an inexpensive one, but for the power it offers, it is both easy to learn and comfortable to use. The program enables you to produce a subtotaled report with three levels of control breaks through a single command, test routines without leav-

■ PROGRAMMABLE RELATIONAL DATABASES



FACT FILE

Metafile, Version 8.2

Metafile Information Systems Inc.

401 16th St. SE, Rochester, MN 55904; (507) 289-8967

List Price: \$995 **Requires:** 128K RAM, two disk drives, DOS 2.0 or later.

In Short: A highly flexible applications generator for intermediate-level database users who prefer a choice of either interactive or programming modes.

Metafile is very versatile, if somewhat expensive.

Copy protected.

Circle 678 on Reader Service Card

Metafile's menu-driven "Assistant" facility is helpful to less experienced programmers; however, this system is definitely not for beginners.



ing your editor, access data files in one part of the screen while you write programs in another, and format text-oriented reports as if you were setting up a mail-merge in a word processor.

Perhaps the best way to grasp this program is to test its boundaries. This is not a menu-bound applications generator for novices. Although the program comes equipped with a capable menu-driven "Assistant" facility, to use the program effectively you should be comfortable working in an ad-hoc query environment. On the other hand, *Metafile* is not in the same league as those few powerhouses that can do such things as access multiple files with a single list statement or create virtual files.

Instead, *Metafile* presents a happy medium for intermediate through advanced database users. A good deal of the program's richness results from the intentional blurring of the crisp boundaries that normally separate interactive from programming facilities in a database. The interactive mode allows you to work either from a blank command line, a menu, or a combination of the two. The programming facility enables you to draw upon the im-

mediate mode to do such things as interrogate functions and formulas in your code for their current values, execute individual lines of codes or whole routines, trace code execution on-screen, query or edit a file in a separate window—and do these things without leaving *Metafile*'s integral editor. That's real polish, but scattered among such gems are a few pieces of coal. For example, *Metafile*'s function key assignments are poorly adapted to the PC's keyboard, and its requisite use of the uppercase in commands and case sensitivity in field names and filenames are real annoyances in immediate mode and caused some perplexing problems in procedures.

DATA FILE STORAGE *Metafile* stores its file structure description separately from the data file itself, making the data file a pure ASCII, comma-delimited file—with the exception that *Metafile* inserts a numeric flag field at offset 0 in the file. Although its data files are variable in length (and therefore, supposedly, sparing of disk space), not only does *Metafile* store three or four associated files for every data file, the data files themselves sometimes as-

sumed mysteriously large proportions. While *Metafile*'s version of the PC Labs Personnel file was 25 percent smaller than the fixed-length original, its variable-length Salary file, at 45K bytes, was more than two and a half times the size of the 18K fixed-length original. Those of you who have tenaciously stuck with your two floppy disk drives should be warned: if faster access times and low prices haven't convinced you to buy that hard disk yet, this should.

The programming facility offers a structured development environment featuring straightforward syntax, extensibility, and toleration of leading blanks and inline commenting. Nesting of procedures and conditional clauses is currently limited to 22 levels (and if that makes you uncomfortable, the figure will double in the upcoming version). A unique use of the Assistant makes for shortened development time in some cases. If you write a procedure and omit some parameters, at run time the Assistant will automatically assume the role of prompting the user to fill in these parameters.

Metafile shows its considerable data management strength in its ability to reference fields from multiple files in a single conditional statement, undo record updates, and format a complete report with one command—although it can access only one file to do so. The List command takes parameters to describe the fields to include their column heading, offset, and length; whether totals, averages, summaries, or control breaks are to be performed on them; and how each of the fields is to be formatted.

However, there are two penalties for such flexibility. First, these specifications are a required course on the *Metafile* menu; you cannot issue a List command without parameters to produce a default list including all fields. Second, with all these options appended to it, the List command can become very lengthy; yet *Metafile* does not allow you to break commands across lines. For example, one line of code used to format PC Labs' programming exercise report was almost 190 characters long. That's one line of code covering three normal page widths—and yes, the screen scrolls slowly when you type past the right border. You can work around this limit by

using macro substitution to reduce the effective length of a command—and since *Metafile* limits you to 250 characters on a line, you will probably be forced to do that when writing long List statements—but why should you have to?

ACCESS LIMITATION A significant limitation concerns indexed access to the file. *Metafile* locates only the first instance of the key value you request. So in PC's personnel database, it's impossible to use a fast indexed search to locate each succeeding record where the department number equals 100. Since the command to perform such a search always starts from the top of the file, after the first find, you cannot reissue it to find subsequent entries. If you simply ask for the next record, you will move through the file in physical (not indexed) order.

There are two ways to overcome this limitation: sort the file before you find a key so that you can use a While loop to step through the succeeding matching records, or produce a logical subset of the file consisting of only matching records (similar to *dBASE III's* "set filter" option). However, neither method matches the ease and rapid access of reading through an index file to find the next occurrence of the matching entry. Thankfully, the program's publisher says it will remedy this drawback in Version 9 (that version will also increase the number of data files that can be open from five to eight). It could also use improved support for error handling in procedures. Although *Metafile* has built-in routines to pause and prompt a user during an error condition (such as an unavailable printer), a procedure cannot trap and branch on such errors.

The versatility embodied in its interactive Assistant, report editor, programming facility, and communications and multiuser capabilities make *Metafile* a good choice for intermediate to advanced users—but its stiff \$995 price tag may discourage you unless you intend to exploit those features fully. While *Metafile* may not match all the relational functionality of such less costly programs as *Knowledge Man* or *dBASE III Plus*, it comes close, and in many cases its development facilities make it more accessible.

—Dick Ridington



FACT FILE

NPL/R, Version 2.0

Database Applications Inc.

400 Wall St., Princeton, NJ 08540; (609) 924-2900

List Price: \$595 Requires: 256K RAM, two disk drives, DOS 2.1 or later.

In Short: *NPL/R* is a Category 3 product for less experienced users. Its ease of use makes this database attractive to nonprogrammers, but its difficult nonprocedural language will put off most programmers.

Not copy protected.

DISK 1.0000

READER SERVICE CARD

NPL/R's full-screen text editor allows users to devise and work with business applications programs using the built-in nonprocedural language.

NPL/R



NPL/R

The appeal of *NPL/R* from Database Applications Inc. is that it gives nonprogrammers the chance to design a powerful database and generate applications programs using nonprocedural language commands. These intuitive commands, such as Over, Print, and Create, emulate the natural thought process and bestow an ease of use on the nonprogramming aspects of *NPL/R*.

An *NPL/R* database starts with two preset screen formats: master file and data file. Entering master file information requires defining the data type, length, and the nickname feature, which really oils the gears. Defining a master file creates a built-in data entry form. During data entry, a press of the Tab key will duplicate the field contents from one record to the next. You can also use this feature with the Insert key, which allows you to add a new record that follows a record with similar data—thus saving many keystrokes. While in the data entry mode, you can search for a particular record by equating the desired variable to a preexisting field.

Once two files share a common field,

you can easily implement a relational structure. With *NPL/R* you restructure a database by simply retyping the field names you wish to keep along with the field names you wish to add and then saving the end product to a new file name. Conversely, you can delete file fields the same way.

NONPROCEDURAL LANGUAGE

NPL/R contains a full-screen general-purpose editor in which the programs are created in *NPL/R's* nonprocedural language. The language, which has its roots in *Ramis* and *Focus*, uses the *NPL/R* data files to devise and execute business applications programs. PC Magazine Labs tests showed this editor and nonprocedural language to be capable of producing elementary programs in which data is sorted and subtitled quickly.

PC Labs tested the efficiency of *NPL/R's* advanced programming features by using them to solve the Labs' advanced database problems. I set up a nine-word if-then-else statement to exclude certain records that were outside the scope of the solution. Correctly defining and compiling this statement took over 3 hours of experi-



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speed. There's even a high-resolution monitor for text and graphics.

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CIRCLE 346 ON READER SERVICE CARD

■ PROGRAMMABLE RELATIONAL DATABASES

mentation. In an attempt to get an answer, I ran my program five times, substituting different configurations of the if-then statements and the nonprocedural language based on examples in the book. To add to the frustration, the *NPL/R* manuals do not have an error interpretation section to explain the error messages displayed on the screen.

Whenever the if-then-else command is written and the condition is satisfied, the result is not given but is set to a new variable. Database Applications Inc.'s telephone support staff told me that my new variable's field format had been set as an integer instead of a floating format, which prevented my seventh try from displaying the decimal solution. The program's manual doesn't adequately define a simple if-then-else command, and using the command is too complex to be compatible with the simplicity of the nonprocedural language.

Failures of the if-then command aside, the features of this nonprocedural language are that its programs can contain numerous nested execs that reference other exec files, and it can contain open variables that can prompt at the console for specialized input. In addition, a 2,048-character buffer can copy text from any disk file on your system into your editor. To enhance the data entry process, the exec files let the user create entry screens, define protected fields, and place editing controls on selected fields. Finally, a debugging facility sends line-by-line execution of your programs to the console and thus makes spotting errors when on the seventeenth take of the "if-then" program easier.

CREATING REPORTS AND USING FILES You can create many reports using *NPL/R*, partly because they are easy to make but mainly because you can save report formats only when in programming mode. One report line can contain a potpourri of commands like Sort, Boolean operators, and Min/Max. A handy addition is the ability to easily switch the output from the console to the printer and back.

To successfully use PC Labs' three ASCII data files with *NPL/R*, I had to edit the *NPL/R* master file format. The reason is that *NPL/R* master files automatically add

two characters to mark the end of a record and add another character so that the record can be flagged for deletion. I constructed a process-of-elimination chart and matched data formats with methods of editing the *NPL/R* master file until I had edited out the *NPL/R*'s delete character line.

The *NPL/R* primer, the first of the two manuals, gives a solid understanding of the basics of the database. The second manual, which describes *NPL/R*'s advanced applications, uses examples that you can follow by using prepackaged *NPL/R* data files. An error-handling appendix and more examples of the programs would improve the second manual.


The program was easy to understand and use, until I started programming in *NPL/R*'s nonprocedural language. While the programming language contains powerful commands and concepts, I found the ones I tried harder to understand and get working than those of the conventional programming languages. Until these programming concepts are better documented and simplified to be compatible with the rest of the program, *NPL/R* probably won't be on your list of programs to buy.

But, because of the nonprogramming aspects of *NPL/R*, you might take a look at the new version due for release this summer.—Nancy Trespasz

ORACLE



In 1979 Oracle Corp. brought IBM's relational technology to market before IBM did. Since then the company has ported its *Oracle* relational database system to a wide variety of mainframes, minis, and personal computers. Completely portable across all types of machines, the *Oracle* system brings to the IBM PC environment a truly relational database management system that has the advantage of being completely compatible with IBM's mainframe SQL/DS and DB2 systems.

NO LIMITS The heart of the *Oracle* system is its implementation of SQL, IBM's powerful query language, which allows access to almost unlimited amounts of data, both stored and viewed in tabular form. Data is held in variable-length fields. Rows define records, and columns

**FACT FILE**

Oracle, Version 4.1.4
Oracle Corp.
20 Davis Dr., Belmont, CA 94002; (800) 345-DBMS; (415) 598-8000
List Price: \$1,000 **Requires:** 512K RAM, A hard disk drive, DOS 2.0 or later. **In Short:** A first-class system for professional database systems, Oracle implements IBM's SQL query language and accommodates interfacing with minis and mainframes. Copy protected.

ORACLE 4.00 ON
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UF1 compute sum of record on drive format 05 000 000 00
UF2 equate record format 000 000 000 00
UF3 column record heading: SALARY
UF4 column name heading: last name format all
UF5 column column heading: Employee number format all
UF6
UF7
UF8
UF9
UF10
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UF100

A typical Oracle UFI and SQL sequence to define and format a query.

define data boundaries. The intersections of rows and columns define fields. "Simple" SQL commands build, alter, expand, and delete tables, rows, and indexes. You can add columns to a table, up to a maximum of 254, but you cannot delete them. However, by setting a column to a null value, you can reduce its effective length to zero. Rows (records) are added to tables without limit, and tables expand to fill a database, which will expand to fill a data-space, limited only by hard disk space.

The *Oracle* data dictionary, which offers information on every aspect of a database, such as tables, users, indexes, data-spaces, and access privileges, maintains the entire database and its tables.

USERS NOT FORGOTTEN The system's user interface is excellent. *Oracle* places a shell, called User Friendly Interface (UFI), around its system, and SQL statements are processed and executed through this shell. The UFI allows SQL statements to be modified, debugged, stored, recalled, and run.

The UFI controls the environment the user works in, and it in turn is controlled by an extensive set of parameters that you can easily modify. UFI gives you direct access to DOS whenever necessary.

UFI also controls the formatting of data. When an SQL sequence is processed, the raw information selected is first passed through UFI and then presented according to the user's formatting instructions.

SQL—A CLOSER LOOK The SQL Select statement is the workhorse of the entire *Oracle* system. Through SQL the user can create, among many other things, specific subsets of tables, virtual tables based on any number of real tables, virtual columns, and specific "views" of data. SQL allows extensive control of access privilege levels and provides numerous string, date, and number functions. Selects can be nested within each other, correlated to provide certain inputs for higher-level Selects, and so on. A single SQL sequence might access three, four, or more tables simultaneously.

Tables are always related to one another through common fields. This ability makes indexing vital for adequate process-

ing times. An unindexed Select using three tables took more than an hour and a half to complete, while the same Select with properly indexed fields took less than 10 minutes. Manipulating multifield indexes within SQL is a simple task.

Indexes are especially important because "really relational" databases do not permit physical sorting of tables. Tables

■ *Oracle* places a shell, called User Friendly Interface, around its system. SQL statements are processed and executed through this shell.

are fixed within the database. The Select command gives you an extensive means of manipulating data by working in conjunction with the Order command, which allows retrieval of data in ascending or descending order on any combination of fields.

MUCH MORE The capabilities of *Oracle* go far beyond what's described here. *Oracle* provides an extensive and complex "screen and forms" facility for applications development. The report writer is excellent, with ample text-formatting ability, a special minilanguage, and the ability to nest Select clauses—a powerful feature. These are not novice tools. Programming experience is mandatory.

Although *Oracle* does not offer a procedural language, the system is most certainly not hampered by this lack. I was able to produce a PC Magazine Labs Category 3 programmed report through the report writer. *Oracle* does give you, however, what it calls a C Precompiler, which gives C programmers a direct interface to *Oracle* databases.

Installing the system on an XT was extremely simple. Bringing external data files into an *Oracle* database, while not straightforward, is simple enough for an

experienced user to manage.

At \$1,000, *Oracle* is a high-priced product, but you get what you pay for, from excellent documentation and company support to flawless performance. For professional database applications, especially those where mini and/or mainframe SQL interfacing is necessary or desirable, I'd seriously consider using *Oracle*. It's first class all the way.—Tony Rizzo

PARADOX

Paradox, Version 1.1, increases the flexibility and power of one of the most exciting software products of 1985. *Paradox* is a full-featured relational database management program providing a special environment for working with data. It is highly interactive, with an interface similar to that of 1-2-3. The essential tools for structuring, modifying, and organizing data are available from menus. Reports and entry screens may be "painted" on the screen, so they closely resemble their final form. Queries can be developed naturally through a trial-and-error process.

Effective data management usually requires extraction of particular sections of a database. A query such as "give me a list of all employees working in department 14 who were hired before 1983 and earn less than \$19,000 or more than \$24,000" will require a fair amount of typing in certain programs. If the query fails because of a typing error or bad planning (you didn't ask what you thought you were asking), those programs often require the code to be reentered. With *Paradox*, you specify data for extraction by filling in a form, frequently with just a few keystrokes. If there is a problem with the query or you want to go a step further in isolating your data, you merely revise your form. Neither the query form nor the results go away until you are satisfied with the answers.

GLOBAL REVISION OF DATA If your data is stored in more than one file, you request additional query forms. If a part number and customer code number in a sales table relate to a part description in another table and a customer address in a third, simple examples in the query forms

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Quarterly Sales Report -- First Quarter, 1986

Region	Manager	1985	1986	Total
Region 1	John Doe	1000	1100	2,100
Region 2	John Doe	1200	1300	2,500
Region 3	John Doe	1100	1200	2,300
Region 4	John Doe	1300	1400	2,700
Region 5	John Doe	1400	1500	2,900
Region 6	John Doe	1500	1600	3,100
Region 7	John Doe	1600	1700	3,300
Region 8	John Doe	1700	1800	3,500
Region 9	John Doe	1800	1900	3,700
Region 10	John Doe	1900	2000	3,900
Region 11	John Doe	2000	2100	4,100
Region 12	John Doe	2100	2200	4,300
Region 13	John Doe	2200	2300	4,500
Region 14	John Doe	2300	2400	4,700
Region 15	John Doe	2400	2500	4,900
Region 16	John Doe	2500	2600	5,100
Region 17	John Doe	2600	2700	5,300
Region 18	John Doe	2700	2800	5,500
Region 19	John Doe	2800	2900	5,700
Region 20	John Doe	2900	3000	5,900

Page 1 of 10

Lotus 1-2-3: All releases of 1-2-3 run in
SixPakPremium's DESQview™ windows.

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Region 1	John Doe	1000	1100	2,100
Region 2	John Doe	1200	1300	2,500
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Region 5	John Doe	1400	1500	2,900
Region 6	John Doe	1500	1600	3,100
Region 7	John Doe	1600	1700	3,300
Region 8	John Doe	1700	1800	3,500
Region 9	John Doe	1800	1900	3,700
Region 10	John Doe	1900	2000	3,900
Region 11	John Doe	2000	2100	4,100
Region 12	John Doe	2100	2200	4,300
Region 13	John Doe	2200	2300	4,500
Region 14	John Doe	2300	2400	4,700
Region 15	John Doe	2400	2500	4,900
Region 16	John Doe	2500	2600	5,100
Region 17	John Doe	2600	2700	5,300
Region 18	John Doe	2700	2800	5,500
Region 19	John Doe	2800	2900	5,700
Region 20	John Doe	2900	3000	5,900

Page 1 of 10

Dow Jones® Monitor on-line stock quotations
while working on other projects.

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Quarterly Sales Report -- First Quarter, 1986

Region	Manager	1985	1986	Total
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Region 17	John Doe	2600	2700	5,300
Region 18	John Doe	2700	2800	5,500
Region 19	John Doe	2800	2900	5,700
Region 20	John Doe	2900	3000	5,900

Page 1 of 10

IBM PC DOS 3.31

Send print output directly to printer

Quarterly Sales Report -- First Quarter, 1986

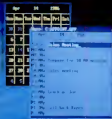
Region	Manager	1985	1986	Total
Region 1	John Doe	1000	1100	2,100
Region 2	John Doe	1200	1300	2,500
Region 3	John Doe	1100	1200	2,300
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Region 18	John Doe	2700	2800	5,500
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■ PROGRAMMABLE RELATIONAL DATABASES

are used to link the three tables. Query forms are also used to globally revise data. For instance, you could increase the prices of 700 parts in an inventory table by 3 percent in a few moments from a query form.

Entry form tools for safety and convenience are provided directly from the menu. Thorough validation checking can be employed to ensure that you do not enter alphabetic characters into a ZIP code field or that you enter five characters, no more, no less. A lookup feature prevents you from entering a part number if it does not exist in the parts table. Defaults can be specified, as well as minimum and maximum values for numeric entries. Calculated results from data entry can be displayed.

The *Paradox* report generator also provides a rich assortment of design tools, but its most outstanding feature is its ability to group and subgroup data for up to 16 levels. You could design a report of all employees, grouped by location, then department within location, then by age sorted in descending order, in minutes. Averages, counts, minimums, maximums, and totals could be included at any or all grouping levels.

Paradox is impressive for the power it provides without any programming. But it also includes a serious procedural language, called PAL, that provides string and math functions, looping and branching capabilities, and a wide array of programming tools. Available system information and the fact that all keyboard keys can be "trapped" allow a high degree of control by the programmer. You can create specialized applications that shield the user from the *Paradox* interface, if you desire. PAL includes a flexible, built-in debugger. If a program is halted for preplanned or unexpected reasons, the state of the machine is preserved so that variables, tables, and queries can be investigated.

A PALSCRIPT The best features of the interactive mode of *Paradox* can be incorporated into a PAL "script." After a form or report is created interactively, it is called from PAL with a single command. When a sophisticated query has been satisfactorily developed, the PAL programmer can merge it directly into a script. Most of the real development work is done interactively; *Paradox*'s combination of menu-creation tools and branching abilities lets you

put all the pieces together seamlessly.

Version 1.1, the first major upgrade to *Paradox*, adds the ability to send data out to more than one table from a single entry form. DOS can be accessed from the menu and from within PAL. Ansa Software has discontinued copy protection and has made a new, low-cost run-time version available for developers so that their clients need not purchase the program if they do not require all of its features.

Paradox is a fast and all-encompassing, extremely flexible database manager. I am the kind of person who likes entry forms and reports "just so." As an applications developer, I like full control over the keyboard, for instance, the ability to know if a user struck keys like Esc, Cursor up, and Ctrl-F8. I also like to use different screen attributes and upper-ASCII border characters. But I do not like to write pounds of code to check to see if a user typed "Blue" instead of "Bleu" or if employee number 203745 really exists. *Paradox* offers a great deal of freedom while providing the tools to get the job done quickly and accurately.—David Hoffman



FACT FILE

Paradox, Version 1.1

Ansa Software
1301 Shoreway Rd., #221, Belmont, CA 94002; (800) 547-3000;
(415) 595-4469

List Price: \$695 Requires: 512K RAM, two disk drives, DOS 2.0 or later.

In Short: A highly flexible and powerful database that gives users the choice of an interactive mode or a serious procedural language called PAL. Not copy protected.

CIRCLE 656 ON
READER SERVICE CARD

Paradox's "Dept#" and "Emp#" fields are used to relate three tables by the "dept" and "anything" examples, respectively.



PC/FOCUS

PC/Focus from Information Builders Inc. is one of the most extensive database management systems available today for the PC. It is the PC version of the mainframe program *Focus* and, within the limitations of the PC, contains all the facilities available from its parent. Thus, the system is targeted at existing *Focus* users who can take immediate advantage of the compatibility between *PC/Focus* and their existing *Focus* database, or PC users looking for a powerful and comprehensive system.

The program arrives on 11 disks that load into 3.5 megabytes of disk storage. Installation was uncomplicated, although the program is protected by an activator disk that must be resident in disk drive A: until the main program is loaded. (A memory expansion card (512K bytes) incorporating the activator disk routine is available from Information Builders.)

PC/Focus requires a minimum of 640K bytes of RAM and supports a maximum memory of 768K; thus, if you use DOS



FACT FILE

PC/Focus, Version 1.5

Information Builders Inc.

1250 Broadway, New York, NY 10001 (212) 736-4433 (212) 736-6130

List Price: \$1,395 Requires: 512K RAM, hard disk drive, DOS 2.0 or later.

In Short: An extremely powerful applications development tool that was imported from a mainframe environment and may be unsuitable for companies with less-complex needs. Copy protected.

CIRCLE 483 ON
READER SERVICE CARD



A PC/Focus Filetalk display that defines the Master File through a series of overlapping windows.

3.0 or later, you cannot take advantage of expanded memory beyond the 768K limit. *PC/Focus* uses memory to prepare report outputs, and the more available memory, the faster the work is completed.

MAINFRAME HERITAGE Two manuals are supplied—*Getting Started and User's Manual*. I found the former adequate to get a feel for the program; the latter is a technical guide for *PC/Focus* users. New users of *PC/Focus* should consider completing the formal training courses available from Information Builders. These courses are run nationwide, and the level of training and support reflects the product's mainframe heritage.

PC/Focus consists of a series of individual program modules that are called within *Focus* itself. Unfortunately, the user interface to these programs is not consistent. For instance, *Fin* is the exit command for *PC/Focus*, *File* is the exit command from the text editor, and *End* is a synonym for *File* when using the Scan program.

Talk routines are windowing programs that guide you in the preparation of data structures, data entry, and retrieval rou-

tines. They do not cover all options available under *PC/Focus*, and additional programming effort is necessary in order to produce the required end product. For this, *TED*—a general-purpose text editor—is used.

COMPLEX DATABASE STRUCTURE

Database files can be relational, hierarchical, or cross-referenced complex multisegmented (up to 16) structures. Field relationships within segments are one-to-one and between segments are one-to-many. Segments are linked on a parent-child basis, and data duplication between segments is eliminated. When one or more other databases are linked together with the Join command, the new files are logically incorporated into the main file hierarchical structure.

The complexity of the database structure demands that your initial design of the system be efficient. More than in other databases, with *PC/Focus* poor design results in poor performance. Correcting your mistakes is costly, too. In order to reorganize existing databases to improve performance, you are required to redesign the database Master File layout and then

completely rebuild the data files. The procedure is lengthy and cumbersome.

To import data into *PC/Focus*, you first specify a Master File and then write a Modify program to load the data in the correct field and index sequence required by the database.

When a Master File is prepared, you specify field-content editing (length, character type, and format) with Filetalk. For any additional special editing for values, required fields, calculations, table look-ups, and so on, you use the *TED* text editor. Index fields must be located at the beginning of each segment; up to three index fields are allowed per segment.

PRODUCING REPORTS Using *PC/Focus*, you can produce extensive and complicated reports—however, it is not a simple task. "Table" programs are prepared with Tabletalk or with the *TED* editor. Reports can be displayed on-screen or sent to the printer. Data can be displayed in columnar or across-the-screen format, and all types of calculation, breaks, and totaling can be programmed. But in order to make full use of the options available, you must have a good working knowledge of the Table language.

Without doubt, *PC/Focus* is an extremely powerful database management system and applications development tool. In an existing mainframe *Focus* environment, it should be the PC database program of choice, especially since training is reduced to a minimum and file compatibility can be taken for granted. Elsewhere, if your company is seeking a powerful database system to handle very complex file structures, you could find the answer with *PC/Focus*. But if your requirements are less complicated, you'd probably be satisfied with simpler and less-expensive database systems. —Brian H. Stephens

PRACTIBASE

PractiBase is a lower-cost and somewhat more versatile adaptation of Ashton-Tate's *dBASE II*. While *dBASE II* and *PractiBase* files aren't compatible (although they can be mutually translated), the programs' structures and most of their commands are.

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■ PROGRAMMABLE RELATIONAL DATABASES

In addition to supporting the equivalent of *dBASE's* immediate mode and interpretive programming facility, *PractiBase* boasts a full-screen menu to facilitate interactive operations.

THE SCREEN TEST Combining a menu-driven mode with a *dBASE*-compatible ad-hoc query facility is a major *PractiBase* asset. Experienced users will find they can have the equivalent of *dBASE's* dot prompt in *PractiBase's* command line, available by typing a slash at the main menu. It's frustrating that even in this mode you cannot banish *PractiBase's* full-screen menu; the menu repaints the screen and you must type another slash before issuing a second command.

Strangely enough, *PractiBase* lacks the ability to scroll the screen. Once a programmed report fills the screen with output, the remaining data on that "page" writes to locations off the screen. Following a page break, the program begins writing over the data left on the screen from the prior page. Another screen-related anomaly occurs with the interactive List and Display commands. The program does not display field names on the screen, so listing a file containing numeric fields occasions a guessing game as you try to distinguish an inventory part number from the quantity-on-hand figure next to it.

If you intend to work within a single file, you'll find *PractiBase's* menu-driven interface remarkably like having the *dBASE III* Assist system in *dBASE II*. Although screen repainting is slowed considerably by the menu, it simplifies normally tricky command syntax and saves some repetitive work by storing parts of your last query. Combined with on-line help screens and a useful tutorial, *PractiBase* qualifies as an accessible list manager for unsophisticated users. Considering that the documentation is almost exclusively devoted to the use of this mode, *PractiCorp* International seems to intend the product for such an audience. While the menu-driven Import command supports files from *dBASE II* and *PractiCorp's* spreadsheet program, you must use command mode to import ASCII files, a point erroneously stated in the program's documentation. Although the Import command works, it is flawed. It mysteriously ap-

pended 15 records to the 500-record file—mangled copies of records contained elsewhere.


(That isn't the only problem *PractiBase* has brewing on the disk. After records marked for deletion were deleted with the Pack command, files containing such records failed to compress, needlessly tying up valuable disk space.)

CATEGORY 3, JUST BARELY *PractiBase* allows you to keep three data files open (one more than *dBASE II*), but don't let that fact persuade you of the program's relational power. Were it not for its ability to be programmed, it would probably be reclassified as a Category 1 file manager because it is almost exclusively through programming that it earns its stripes in the multiple-file category.


The single exception to this is the interactive Join command. However, Join, a relational command that physically merges records from two files to create a third file, is both slow and wasteful of disk storage space. I tried using it to design a relational report structure. Fourteen hours and about 7 megabytes of lost clusters later, I admitted defeat.

On the other hand, a *PractiBase* procedure file solved the problem effectively, though not especially quickly. Separate commands are needed to open a file, find the data you need, store it in a variable, then open another file, and repeat the process until you've collected all the data needed to print a single detail line. The entire process must, of course, be repeated for each subsequent line of the report. There are no commands capable of linking the record pointer in one file with the record pointer in another file (although *PractiCorp* says such a command is in the works for a future version) or of accessing multiple files with a single Find, List, or Report command—any of which would simplify the job.

If you purchase *PractiBase* for multifile work and therefore intend to program it, you will need at least two other things: a text editor to write your programs (your editor will not be accessible from within *PractiBase*) and *dBASE* programming skill. The documentation provides only a 13-page pamphlet with a dictionary-style listing for each programming command. It contains no programs, routines, or tutorial and omits discussion of many points im-



FACT FILE



PractiBase, Version 1.14
 PractiCorp International Inc.
 44 Oak St. The Silk Mill; Newton Upper Falls, MA 02164; (800) 858-2727;
 (617) 965-9870
 List Price: \$99.95 Requires: 256K RAM, two disk drives, DOS 2.0 or later.
 In Short: An accessible list manager for unsophisticated users that nevertheless demands considerable programming skills. Not copy protected.

CIRCLE 670 ON READER SERVICE CARD

PractiBase combines a *dBASE*-like command structure with a full-screen menu to help less experienced users.

PractiBase V1.14

<div style="border: 1px solid black; padding: 2px;"> List Create Shows Quit Clear Screen Run Select </div>	<div style="border: 1px solid black; padding: 2px;"> Create Edit Append Insert Delete Recall Change Fld </div>	<div style="border: 1px solid black; padding: 2px;"> Find Join File Get File Total Update </div>	<div style="border: 1px solid black; padding: 2px;"> Variable File New Release Insert Export </div>	<div style="border: 1px solid black; padding: 2px;"> Display List Display New Count Sum </div>	<div style="border: 1px solid black; padding: 2px;"> Modify Index Pack Merge Modify str </div>
--	--	--	---	--	--

Explanation
Enter a command then press return, or just return

Command: SELECT RECORDS...

Primary database: person.dbd Current record: 1

portant to even experienced programmers if they aren't already acquainted with *dBASE* programming (for example, the need to precede a variable with an ampersand when using it to execute a Find). Fortunately, *PractiBase*'s similarity to Ashton-Tate's product makes it possible to draw on existing *dBASE II* instructions.

The program's \$99.95 price makes it attractive for those on a tight budget, and *PractiBase* delivers a lot of value for that money. Relative to *dBASE II*, a simpler user interface in the single file, interactive mode is *PractiBase*'s major asset; the addition of date math (although without character-to-date conversion), memo fields, password-protected encryption for data files, and an additional work area may simplify your work somewhat further. But *dBASE II* no longer defines the state of the art in relational databases, and by extension neither does *PractiBase*. If your work regularly requires access to more than one file, be sure to consider the cost of labor. Writing programs is expensive work.

—Dick Ridington

PROBASE

Probase is seemingly intended for two distinctly different audiences: intermediate-level users who need to be able to produce multifile reports without programming and expert users who are comfortable with assembly language programming.

Probase, Version 2.0, traces its roots back to 1980 and spans CP/M, CP/M-86, and MS-DOS environments. It is available in both single and multiuser versions (this review covers only the MS-DOS single-user version). The program contains three capable, menu-driven applications generators for data entry and inquiry, reporting, and custom menu creation. These generators enable you to accomplish a lot of work with great ease, but at the same time they lack the flexibility and immediacy of an ad-hoc query facility.

DEVELOPING AN APPLICATION If you're developing a reasonably straightforward multifile application, there's a good chance the applications generators can handle it. The data-entry and inquiry



FACT FILE

Probase, Version 2.0

Probase Group Inc.
1738 W. LaPalma Ave., Anaheim, CA 92801; (714) 535-2833; (714) 535-2834

List Price: \$395 **Requires:** 192K RAM, two disk drives, DOS 2.0 or later.

In Short: A demanding programmable database manager that uses three menu-driven applications generators combined with a high-level language facility. Not copy protected.

CIRCLE #79 ON
READER SERVICE CARD

Probase's data-entry and inquiry generator can link up to four files simultaneously. Here, it links the primary Person file to the secondary-Salary file.



generator can produce applications using four data files simultaneously, but there is no default single-file data-entry screen—and designing even a simple one is a time-consuming proposition I'd rather skip.

When you execute an application, *Probase* displays the data-entry screen and proffers its own menu of file maintenance and inquiry functions. A list of functions omitted from this menu only increases your hunger for that absent ad-hoc query facility. *Probase* denies access to record numbers, preventing you from checking your position in the file and making it difficult to distinguish duplicate entries from duplicate displays of the same record while cycling through the file. The "print records" command allows you to print selected records in data-entry format, although in my tests, depending on the position of the record pointer, it occasionally double-printed records or printed records that had recently been deleted.

What you can do is move through the file one record at a time (forward or backward) or search for the next occurrence of a single or compound condition—but only on fields you defined as searchable when you created the file. Deletes are available

but restricted in scope to the current record. No sorting is possible, so you never have the option of eliminating the delays associated with keeping indexes open by sorting the file all at once.

DATA ENTRY During data entry *Probase* displays zeros in blank numeric fields. When I entered values less than the full length of a field, *Probase* appended its default zero value to the end of the entry, erroneously increasing it by a factor of 10 (100 became 1,000). The solution involved my entering a decimal point as an explicit terminator to each entry, an obvious invitation to inaccurate data entry. Editing functions here, as in other areas of the program, are minimal. You can do little more than use the Space bar to overwrite errors.

The report generator develops applications using three files (that's one less file than the recently revised data entry and inquiry generator) and produces reports in either free-form or columnar format. Although the third file can only exist in a one-to-one relationship with either of the other two (a record from one file may correspond with only one other record in the

■ PROGRAMMABLE RELATIONAL DATABASES

ponent menus, the going becomes tough indeed. Unfortunately, the manual has a poorly integrated set of programmer-related chapters and is much too terse.

MASTERING THE COMPONENTS

You must master several major components before anything useful can be accomplished. These components are called through the operating system, so that you're never entirely removed from DOS. They are: BTSYS, FB, FID, RG, and QNE, as well as various utility programs.

BTSYS, the file-handling system, is a memory-resident program that, once loaded, returns you to DOS and waits for the run-time component to call for its services. BTSYS will also run in conjunction with the run-time component when you invoke both at the DOS command line, in which case BTSYS will unload itself when its services are no longer needed.

FB is the format builder, through which files and fields are created or updated. Programs that will provide detailed field checks can be built directly into a field's definition. FB also supplies the interface through which programs are defined.

FID, the file item description generator, gives programs a program-independent view of files. Fields defined through FB can be further defined through FID. Fields can be expanded to repeat themselves, up to 65,000 times, effectively creating arrays within files. A description of each file can be provided. Fields can be aligned with other fields within a record—an advanced issue that can't be elaborated upon here. Finally, FID provides the means to define keys for a file.

RG is the powerful report generator, made completely complex by the manual but ultimately easy to use once an enormous amount of jargon is mastered. Lastly, QNE is the run-time program. And there are various utility programs as well.

LEARNING THE LANGUAGE *Q-Pro 4* has no built-in query language. A query module called Q-Query is available as an option from Quic-N-Easi. All things in *Q-Pro 4* are done through the programming language.

FB, FID, and RG are menu-driven and provide predefined screens where definitions can be placed. FB and RG provide a

free-form screen to design input/output forms. Prompts and other text are placed independently of field locations, giving you easy and complete control over forms and reports.

Life couldn't be any easier. But when the task at hand turned to converting the sample data files to *Q-Pro 4* format and to setting up indexes, it became necessary to use the programming language.

Becoming acquainted with this language and the way it works can take a long time. The manual actually states it best: "The user's biggest problem is in understanding the structure of our language—not the commands or the screens, but the interaction of the various elements." In retrospect, it was the manual and its poor organization that made the language seem exasperating to learn.

The language is full featured and powerful, allowing complete control of the environment. It does make extensive use of labels and goto statements. Other languages (*dBASE III*, for example) provide a great deal more functions and allow a more structured programming approach.

The most interesting aspect of *Q-Pro 4* may be the fact that it is both a single-user and a LAN system. It will run on IBMNET and NETWARE (from Novell). The language provides the necessary commands (for example, field and record-level locks and unlocks) to create LAN-based programs.

Certainly a competitive product, *Q-Pro 4* is worth careful consideration if you want or need to go beyond the limitations of *dBASE III*'s file system and if you need the complete control only a strong programming language can supply.

—Tony Rizzo

R:BASE SERIES 5000

First let me openly admit I like *dBASE III*. Its language is not the easiest, and without a compiler its execution can crawl at times, but its overall design and implementation strike a chord I can relate to. That said: Have we got a contender in *R:base Series 5000*?

R:base Series 5000, the Avis of relational database programs, is coming on

strong. Not only does it have a procedural language for programming, but it also comes with a compiler, an easy-to-use applications generator, a sophisticated import module, and a fair-to-middling editor. While none of these modules are new to database packages, the overall implementation of each suggests marketing genius on the part of Microrim.

DIFFERENT STRUCTURES

Although *R:base* and *dBASE* have many common elements, their different underlying architectures impose different database principles and design considerations. *dBASE* addresses itself more to the applications programmer; *R:base* to the end user who needs to customize applications. *R:base*'s structure and commands discourage permanent changes to the database, while *dBASE*'s encourage it. This does not mean you cannot modify an *R:base* database—you can—but to do so, you must go through an extra set of steps.

For example, *dBASE*'s Sort is a command; *R:base*'s Sorted By is an option within a command. The distinction is one of permanence. If you sort a *dBASE* file, it is sorted permanently. If you sort an *R:base* file, it is sorted for only the duration of the operation; once the process is completed, the file remains unchanged. To make the sort permanent, you need to direct the output to a file and then import it as a new table.

R:base gathers all its files as tables within a database while *dBASE* maintains its databases as separate data and report files. The latter implementation may provide a certain amount of flexibility because of the standalone nature of the files, but the first provides a sense of integration and relation lacking in *dBASE*. Changing a column's type (a column is the equivalent of a field) in *R:base*, for example, is possible only if it does not exist in another table. The end result is that a programmer can accomplish the same ends with *R:base* as with *dBASE*, but the end user is less able to alter the original structure.

R:base's procedural language offers a number of relations including intersection, joining, protection, and subtraction. Although *R:base* does not automatically support record numbers, you can use up to three pointers simultaneously to locate

■ PROGRAMMABLE RELATIONAL DATABASES

specific rows in the files. An extremely useful feature is the ability to define a set of rule specifications for data-entry and modification validation. The rules enable you to check, for example, the input of an inventory part against a set of valid parts. You can define such a rule as "Not in our inventory list" inv. part EQ "speaker" Or inv. part "turntable" Or inv. part "amplifier." Up to 11 comparisons can be made with the use of And and Or operators.

REPORT GENERATION *R-base's* report generation capabilities are not the most advanced (even Microrim must agree since it offers XTW, an advanced report-generating program, as a separate option), but they are more than adequate. You can define report and page headers and footers, up to nine levels of subtotals and totals, detail lines, and time and date stamps. Designing a report involves defining the main table from which the report is generated, drawing the screen, defining the variables, and locating and marking the various fields. If you require a sorted table—as I did in each of the reports tasks—you must perform the sort when the command is ex-

ecuted. For example, for the first report I entered, "PRINT preport SORTED BY deptno newsalary lname."

FileGateway is one of the slickest import facilities I've ever seen. Not only will it allow you to define the database after it imports the data, but it will also place exceptions into a temporary bin and then allow you to correct them. Some of the other high-and-mighty packages simply give an error message. (Exceptions are records that fail the import process because, for example, an alphanumeric character is in a numeric field or a key field is blank.) When importing a file, FileGateway displays the first record and prompts you to mark the field's start and finish. From that point on, it takes over. Importing the entire 500-record file took less than 2 minutes.

Express is the menu-driven applications generator. Its greatest strength is that it allows a smooth transition into *R-base's* features. You simply answer one question after another and before you know it, you've created or changed a database, built or altered an application, or designed a menu without having used any of *R-base's* commands. Although defining

the database is a snap with Express, it is not as flexible as the language itself. In all likelihood, you will be using it less often as your familiarity with *R-base* increases.

Rbcompile is *R-base's* compiler. It converts ASCII program files into a binary format. Using it requires simply naming the source file and the destination file. Compiling applications results in execution time savings and prevents alteration of the program.

WEAK EDITOR The weakest link in *R-base's* packages is the editor, Rbedit. Although it marks certain execution errors in the text, somewhat like Turbo Pascal's editor, it lacks many of the features programmers have come to expect, such as windows and block moves. In fact, its features relate only to cursor movement and basic editing. On the plus side, it does support the IBM graphics set of characters. Still, if you intend to write anything more than a screenful of code, you'd be better off using your favorite text editor.

Clout, an optional natural-language information retrieval front-end, may not create and run your applications automatically. But it will help make *R-base* even easier to use than it already is. Once you define a term in Clout, it acts upon it as though it were the originally defined term. For example, you could enter the query "Find all employees in accounting who make over 40 Gees," and Clout would search the employee, salary, and department files for those employees whose salary fields are greater than \$40,000. What Clout does is not artificial intelligence. It simply looks up the words in its 300-word predefined dictionary, and, if the terms aren't there, it prompts you for their meaning. Clout also supports arithmetic expressions, corrects spelling errors, and has a limit of 500 user-defined terms.

R-base Series 5000 may not be the current standard in relational databases, but it has made enough headway to become a serious heavyweight contender. Its Express module and prompt and help modes make it very accessible to users who need a relational database but do not have the inclination or experience to program one. If you, your staff, or one of your clients falls into that category, *R-base Series 5000* is definitely for you. —Vincent Puglia



FACT FILE

R-base Series 5000, Version 3.1

Microrim Inc.
3380 146th Pl. SE
Bellevue, WA 98007

List Price: \$700 Requires: 256K RAM, two disk drives, DOS 2.0 or later.
In Short: Microrim's *R-base Series 5000* is a sophisticated, user-friendly relational database

package with a procedural programming language that includes a compiler, an applications generator, an editor, and a slick import program. Not copy protected.

Circle 88 on Reader Service Card

R-base Series 5000's import feature catches problems and allows you to correct them easily and quickly.

EDITOR'S CHOICE

The data below contain fields which could not be loaded because of exceptions. These fields are highlighted. Load options are: 1. Do: Force field into record. 2. No: Leave cursor to exception field. 3. Change the data. (ENTER) when done. 4. Load the record. 5. Delete record with unresolved exceptions. 6. Be nullified.

Field Name	Type of Data	Field Length	Sample values
deptno	Integer	11	200
lname	Text	15	George
fname	Text	15	Thomas
empno	Integer	15	12340
address	Text	30	2015 - 12th Ave
city	Text	20	Brooklyn
state	Text	2	NY
zip	Integer	11	11201

Using Lotus 1-2-3 without Reflex is like driving at night without lights

If you use Lotus 1-2-3* you need Reflex. The Analyst,* because it shows you what 1-2-3 either hides in the dark or can't show you at all. Reflex shows you relationships and interrelationships in your data that you can't afford to miss.

Reflex includes the best Report Generator for Lotus 1-2-3

Reflex includes the Report Generator that 1-2-3 should have included—but didn't. With Reflex, you can generate reports, graphs, charts and diagrams from your 1-2-3 worksheets that are impossible to generate with 1-2-3.

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and file compatibles



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CIRCLE 147 ON READER SERVICE CARD



■ PROGRAMMABLE RELATIONAL DATABASES

REVELATION

No matter what else I try, I always come back to the *Revelation* system from COSMOS. There are some programs that are easier to use, one or two that are a little faster, and many that are cheaper, but, if you claim the title of "power user," this has got to be the best database manager on the market.

Revelation has more raw power and flexibility than all the rest. Without resorting to add-on programs from other vendors, you can have full control of color, dynamic pop-up windows with scrolling text, a feature-rich and easy-to-use ad-hoc report writer, and a true data dictionary system that supports variable-length files, records, and fields. The system is COSMOS' own, but it is clearly based on the concepts of the PICK operating system, which is currently running on over 50,000 keyboards worldwide.

While the database concepts are rooted in minicomputer PICK, the full implementation of *Revelation* recognizes the DOS environment in which it functions. Unlike other PICK-based systems, this one can talk directly to DOS, read and write DOS files, execute DOS commands, feed data to 1-2-3 or *MultiMate* (or any other package you happen to be using), run as a simple interpreter, or compile and execute extended BASIC with incredible speed.

You can operate at any level you choose: beginner (simple ad-hoc report generation), mid-level (generate applications using the built-in RDESIGN package), or real expert (forget RDESIGN and program in RBASIC directly). I know of no other database management system that offers this level of choice and flexibility to the PC user.

This system does exact a price in hardware: you really need all 640K bytes of RAM, and a math coprocessor chip is mandatory for speed in the PC-XT series. The manual says 320K is a minimum, that the math chip is optional, and that you can run *Revelation* on a dual-floppy system. Don't waste your time, folks. This is a really big system, and it will use all of the machine resources you can make available in the standard configuration. Unfortunately, *Revelation* will not utilize expand-



FACT FILE

Revelation, Version G.2B

COSMOS Inc.

19530 Pacific Hwy., South; Seattle, WA 98188, (206) 824-9942

List Price: \$950 Requirements: 320K RAM, two disk drives, DOS 2.1 or later.

In Short: A first-class database based on the PICK operating system that gives the true power user speed and flexibility, *Revelation* features a multi-level user interface. Not copy protected.

CIRCLE 700 ON READER SERVICE CARD

Defining record attributes in the file dictionary is as easy as filling in this screen. Most entries have logical defaults. When completed, each field will have been defined in the dictionary.



ed memory boards that take you above the 640K level (yet).

BUMP DISKS With Version G.2B, *Revelation* is packaged for the single-user system with a built-in upgrade path for local-area networks. All that is required for the move is a \$499 "bump disk" that will alter the single-user software for the network of your choice (over 20 of them) and at the same time permit four simultaneous users to operate *Revelation* over the network. Additional applications of bump disks will increase the allowed number of users by four each time. It couldn't be easier, and the pricing is certainly reasonable by today's standards.

According to Steve Kruse, COSMOS' vice president of marketing, over 26,000 copies of *Revelation* have been sold since its introduction in early 1983. In 1986, the company is shipping copies out at the rate of 1,500 per month. At this rate, *Revelation* will soon outsell the original PICK product.

THE LNK FILE STRUCTURE Version G2.B supports large files (we are talking megabytes) with a new file structure called

LNK. Unlike the standard ROS files that are built as 64K-byte DOS files, in multiples if necessary, the LNK file structure is similar to a preallocated random file that is not under the 64K limitation. For network applications or large databases, this is the preferred method of file storage.

Either filing method utilizes variable-length fields in variable-length records, grouped into variable-length files. Data compression is automatic, since no record attribute is any larger than the data it contains. Additionally, the file structure supports multivalued fields. In a *Revelation* database, any field may contain multiple occurrences of a data element. This eliminates the need for "trailer records" or multiple defined fields that take up space even when no data is present.

Each data file is associated with a file dictionary that stores the necessary data to map the physical file. The ad-hoc report writer depends on this dictionary to decode the keywords used in a report request. Programs can also access the dictionary to determine the relative location of a data element within the record. Unlike most other database managers, symbolic fields, calculated values, and other formulas for re-

■ PROGRAMMABLE RELATIONAL DATABASES

porting are stored in the dictionary, not expressed in the report command syntax. Where other systems let you print `SALARY * 2`, *Revelation* won't. You build a dictionary term called `DOUBLE.SALARY` and in the term definition you specify the multiplication of the `SALARY` attribute by the literal 2.

This may sound like a heavy-handed approach, but consider this: that formula you write into the dictionary can be up to 34K bytes of RBASIC code if necessary.

The report writer also performs on-the-fly joins to generate printed reports from any number of simultaneous files. While it lacks the control and formatting power of something like ACE in *Informix-SQL*, it stands considerably higher in performance than most systems while retaining a simple user interface and command syntax.

Revelation installs quickly from a menu, has a good working tutorial guide and a well-written user manual and technical reference. You get unmatched power, tremendous flexibility, direct interface to DOS, easy upgrading to a network, and all the proven features that made the original PICK system a success. *Revelation* is still number 1 on my list. —**John Phillips**

SAVVY PC

Wouldn't you like to have a program that would do its best to correct your misspellings? That would say "sorry . . ." if it couldn't do what you asked because it ran out of room? That would complete your sentences for you when it could? These are not "pie in the sky" features of some fifth-generation vaporware; *Savvy PC* has them.

Its most glittering attraction—its “pat-tern matching” artificial intelligence capabilities—is aimed at making it a product that novices can take to quickly, yet it can still be used for powerful, multifile applications. All that glitters is not always gold, however, and some of *Savvy PC's* shortcomings need careful attention before you take the plunge.

MORE THAN A MANAGEMENT PROGRAM It is difficult to explain just what


GREEN It is difficult to explain just what Savvy PC is. It is a database management program and more. You can paint data entry screens and let Savvy PC generate the code you need to create and use them, or you can develop your own procedures.

You can also edit the generated code to customize it for your special needs. It has edit-masking capability and a full set of program commands, including string manipulation, internal and external file control, and program control (If, For, Goto, and so on). It even has commands to play music and conduct telecommunications sessions.

Savvy PC can be forgiving of careless typing. If you define a procedure called **MY FIRST TASK**, you will find that *Savvy PC* will execute it for you even if you mangle the instruction to the point of asking for **MY FIRST TSK**, **HOW ABOUT MY TASK**, or even **FIRST TASK**. For those of us with unruly fingers, this feature could be a real pleasure.

Savvy PC is still more. One of the problems with describing it is that the full package includes three separate modules: Tutorial, Database Manager, and Retriever. These three are available separately but are designed to work together. The Tutorial covers procedure files (called "tasks") and illustrates how to create and modify your own procedures. The Database Manager includes a set of useful utilities that automate a number of essential procedures, such as data file import, file program generation, and report creation. The Retriever is another set of programs that lets *Savvy PC* learn all about your data files so that you can make requests in English: "If the pay schedule is not monthly, show the employee." The program "learns" information about the specific data in your files, and using "vocabulary" that it knows (and that you can add to), it will try to interpret your questions.


A SPLIT PERSONALITY It is this split personality that is perhaps at the base of the program's problems. Each module comes with its own standalone manual. They are 8 by 11-inch paperbacks, averaging about 100 pages each, and are nicely produced in spite of the fact that they were typeset with a daisy wheel printer. The biggest drawback is that all three are primarily tutorials. Only the Retriever manual has a reference section, which is skimpy at that. Working through the manuals is an exercise in confusion. They are not cross-referenced, so you read in the Tutorial how to program screens and later may find that the Data-



FACT FILE

Savvy PC, Version 5.0

The Savvy Corp.
 122 Tulane SE; Albuquerque, NM 87106; (800) 555-5199; (505) 265-1273
List Price: \$139 for all 3 modules; \$79 each for Retriever, Database Manager, Programming Language **Requires:** 128K RAM, two disk drives, DOS 2.0 or later. **In Short:** Its pattern-matching artificial intelligence capabilities give Savvy PC the attraction of being forgiving to sloppy typing, but it has a restrictive development environment that makes programming cumbersome. Not copy protected.



CIRCLE 661 ON READER SERVICE CARD

Savvy PC's editor automatically indents and numbers your code. Only the items in capitals were typed; the program filled in the rest.

base Manager shows how to use the program generator to do it faster and better.

The manuals have a lot of examples, and each has an index, but it is difficult to find specific information. When I had trouble with the slow data import, I tried to find a way to write my own import procedure. The examples of external file procedures showed how to read in data but did not show how to store the information in a file. I was forced to try to decipher the canned procedure used by the program, but I soon gave up. (How slow was the data import? About 3 hours for the 500-record Person file, and about 45 minutes for the 500-record Salary file. Neither came in cleanly; both had more than a dozen "garbage" records as part of the import.)

Savvy PC does have a reference manual, but there's a catch. It comes on three disks as part of its interactive help facility. That would be fine, except that you can access the help screen directly only from DOS. Leaving *Savvy PC* and returning every time you have a question could get tiresome quickly, so *Savvy PC* made it possible to print out the entire 500-or-so-page collection of help files. If you prefer, you can purchase a printed copy of the reference manual for \$15.95 (a recommended purchase if you get the program).

WEAK APPLICATIONS ENVIRONMENT All this would be forgivable if *Savvy PC* were a strong applications-development environment. It is slow, often because it is trying to find patterns when you don't really need them. The programming language is powerful enough, as witnessed by the fact that *Savvy PC*'s utilities are written in it, but those same utilities are not terrific advertising for its performance, as demonstrated so clearly by the file import. The *Savvy PC* editor is cumbersome, and, while the editor checks for validity to a certain level and automatically numbers and indents your code, you must use its unique "call and response" writing process. You type a keyword and press Enter, then *Savvy PC* answers with a phrase, and then it is your turn again. You cannot just haul off and write a few quick lines of programming code, even if you know the syntax. Program files must be no longer than 1,000 bytes, and you are limited to 64 levels of nesting and recursion, so that very

large applications may be difficult.

Programming is required at many steps along the way. There is no way to perform an indexed search using the query facilities, so I had to write my own. In fact, to look at a table in a different order, you first have to create a separate index and then write a procedure to build it.

The final blow is that the program is not particularly robust. *Savvy PC* is one of those programs that think they know better than DOS and the rest of us about how files

■ *Savvy PC*'s most glittering attraction, its "pattern-matching" artificial intelligence, makes it a product that novices can take to.

should be kept. It hides everything in a single DOS file: data, structures, procedures, definitions, and all the rest. It then handles the complex task of maintaining its own set of pointers to different information. This is dangerous because you must leave the program properly or suffer the consequences. A "helpful" colleague saw that I had "forgotten" to turn off my computer (I actually left the import utility running overnight) and helped out by turning it off for me. As a result, I was locked out of all my data and had to start again from scratch. A scan of the possible system error messages turns up some unsettling prospects, such as "Your disk may be in trouble; try DIAGNOSTICS," or the more ominous "Disk in trouble."

In the final analysis, *Savvy PC* may be too smart for its own good. It promises power and simple operation for all users, but it requires too much programming for even simple operations to be of much use to the novice, and the restrictive development environment and performance constraints will discourage the more technical users. *Savvy PC* is reasonably priced and can do a lot of neat stuff. If you want an in-

teresting package to experiment with, then give it a try. Otherwise, look elsewhere.

—Alfred Poor

THE SENSIBLE SOLUTION

In the dark ages of computing, about 5 years ago, you had to be technically oriented to make most software work. Programs were sort of like dancing bears: it wasn't so much that they were good at what they did, it was enough that they performed at all.

Since then, newer programs have taken on much of the technical burden, keeping the esoteric details hidden from the user's view. Pop-up menus, context-sensitive help, and other facilities make these easier to use than their forebears. Some of the older programs failed to change with the times; they have disappeared, while others have grown and tried to keep up. *The Sensible Solution* is one of the latter. While it still shows its CP/M heritage in spots, it also takes a thoroughly modern approach to many of its tasks.

Like *TAS: The Accounting Solution* (which was written by someone who worked on earlier versions of this program), *The Sensible Solution* requires you to create a source code procedure file and then compile it. Unlike its more difficult cousin, it makes this process easier by supplying an intelligent text editor and access to the compiling program within the program itself.

AN INTELLIGENT EDITOR The program's impressive feature is its editor. While it automatically numbers your code (which is nice, but not unique), what makes the editor special is that it lets you create the command lines by making selections from a 1-2-3-like menu at the top of the screen. As you make your choices, the editor then presents only the appropriate subsequent choices. It does not supply field or table names, but it does check to see that you have entered a valid item from the data or file dictionary. As a result, you can still make logic errors in your code (such as open loops), but it is impossible to create a syntax error. Once your code is created, the compile process is just a quick

■ PROGRAMMABLE RELATIONAL DATABASES



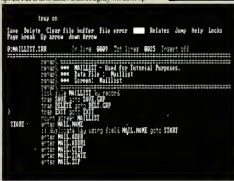
FACT FILE

The Sensible Solution, Version 2.0

O'Hanlon Computer Systems
11058 Mann St., #110, Bellevue, WA 98004, (206) 454-5350
List Price: \$695 single user; \$995 multiuser. **Requires:** 128K RAM, two disk drives, DOS 2.0 or later. **In Short:** Aging gracefully, this program still shows its CP/M heritage in spots, but it also takes a thoroughly modern approach to many tasks. Its impressive feature is its editor, but one drawback is that it cannot import data. Not copy protected.

CIRCLE #13 ON
READER SERVICE CARD

The Sensible Solution's source code editor creates the procedure files based on your choices in a series of nested menus. The labels in the left margin are used to control the flow of the program.



The SENSIBLE SOLUTION

selection from the main menu.

For many simple applications, you won't have to use either the editor or compiler because *The Sensible Solution* also includes a screen-painting facility and a code generator that uses the painted files. You use the paint module to set up entry screens (where you can also add definitions to the data dictionary) and report forms. There are special commands to automatically draw boxes (using the high-order character graphics) and get a file or hard-copy printout of the screen or report format. You then go to the Program Generator option, and it quickly checks the fields, generates the source code, and compiles the code. If you want, you can go back to the source code and modify it, then recompile. In this way, you can let *The Sensible Solution* do most of the work.

One other useful utility is an inquire facility. This provides a way to make a quick report based on up to four conditions, using a single field as a sort. These inquiries can be saved and used again. It is not as powerful as most programs' ad hoc query facilities (especially those based on SQL-like syntaxes like *dBASE III*), but it should do for many circumstances.

INSTALLATION AND DOCUMENTATION *The Sensible Solution* is not copy protected and installs quickly. There is an install program, but you simply select the IBM terminal option, and you are ready to run. Since the program can run on other computers (such as Texas Instruments) that have different BIOS requirements, O'Hanlon had a problem with preconfiguring the program for operation on the IBM PC.

The manual is clearly written with a long tutorial section and an alphabetic reference section. The tutorial has the interesting and educational feature of repeating the procedure files on the left page while discussing the key strokes required to create them on the right page. This two-page spread leaves the entire file where you can see it, making it easier to track your progress and see where you are going. It takes more paper, but I liked it. The reference section suffers from a lack of examples for most commands.

The program is not very quick to work with, especially since you can't just write your own source code using an ASCII text editor. The menu-driven approach is nice, but it doesn't feel smooth. You will need to

write your own procedures, both by modifying the generated files and creating your own from scratch, if you plan to do anything but the simplest tasks. You can do almost anything with the program, but it takes time to learn its approach.

QUIRKY PROGRAMMING One example of *The Sensible Solution's* quirky programming is the way that memory variables are handled. Unlike most programs where you can create them on the fly, or at least define them at the start of a procedure, you must create a data dictionary entry for each variable. Before you can use them, you must also go and explicitly reinitialize the memory variable table to make the variable available to your procedure.

One other drawback is that the program cannot import data. There is a way if you restructure your data file to certain specific dimensions and parameters, but this is beyond the skill or patience of most users. As a result, I had to type in the first 25 records of the PC Magazine Labs test record rather than try to bring in the entire 500 records.

The Sensible Solution has made an effort to keep current and manages to make serious power available. This requires programming, however, so plan on investing plenty of time in learning and experimenting if you decide on this one. *The Sensible Solution* takes more effort than some of the alternatives, but it does get the job done.

—Alfred Poor

THE SMART DATA MANAGER

The Smart Data Manager (SDM) is part of Innovative Software's integrated family that includes *The Smart Communications* (package), *The Smart Word Processor*, and *The Smart Spreadsheet with Graphics*. While the integrated package is highly synergistic, we looked at *SDM* as a standalone product to stay within the guidelines of this feature article. (*The Smart Communications* comes with all standalone versions because it contains *Smart-Software* internal system management functions.)

Sold either with or without its siblings, *SDM* is certainly smart enough and powerful enough to stand alone in the high-end

database management world.

SDM is based on the relational model. It has a query language, macros, and an internal programming language, all of which enable the user to develop sophisticated, polished applications.

A LARGE AUDIENCE Innovative Software has aimed this package at a wide range of users and has wisely designed the product (and documentation) to meet that range. In most processes, *SDM* prompts you for actions using plenty of carefully explained prompt messages and additional context-sensitive on-line help. However, as you grow more comfortable with the product, you can select ever less "helpful" operational modes until the screen contains only a prompt character.

SDM's on-line tutorial is excellent. Both the tutorial and the real-world system boot up in a screen mode with a work window at the top of the screen, and menu, command, and help lines at the bottom.

The displayed menu items are actually part of a large menu tree. The Plus and Minus sign keys (or Slash/Backslash keys) are used to prowl through the menu tree. As each item illuminates, an optional ex-

planation appears on the bottom line. Pages of help on the illuminated item are available at the press of a function key. When you hit the Return key, the illuminated item (usually a command) is invoked.

All of *SDM*'s features can be reached using these menus. Files are created by responding to prompts and answering questions; forms are painted and queries are made by moving the prompt-line cursor and answering questions.

Although timing data import was not one of our reporting points, I have to note in passing that *SDM* loaded and indexed the initial benchmark files in about half the time of the other systems I tested—and none of the others is considered a slouch among high-end, micro-based DBMSs.

AN INTEGRATED PACKAGE Obviously, the *SDM* user who opts for the full integrated package will get the most use out of *SDM*. It is designed specifically to move records and partial record data in and out of its integrated spreadsheet and word processor. It uses its own file format for these transfers, so that data movement is instantaneous.

If you go with *SDM* as a standalone, you needn't fear compatibility shortcomings. Its file-transfer modes include fixed length (SDF) and ASCII with just about any delimiter. An advanced user can also program any output format required.

Indexes and record-to-record links and relinks can be made very quickly even in the menu-prompt mode. Therefore, this system is ideal for either the application that tends to wander and grow or for the user who likes to take things slowly, adding elements to his database feature by feature without having to backtrack.

SDM supports conventional data types as well as virtual (calculated) fields and automatic table lookups. It also has a "name" type field—this is the only database I have seen that has such a data type. Basically, the name field keeps first and last name information in a single field for easy keying. Users of other programmable databases might think of it as a virtual field that does a `CONCAT(TRIM(FNAME)+LNAME))` trick and indexes on it automatically.

This is an excellent product. Its on-line tutorial is excellent, and its massive documentation is as good as I have seen. A professional applications designer might want a product that is a little less helpful while a computerphobe with limited database requirements would certainly want something less comprehensive. However, for the middle-of-the-road business-systems user, *SDM* is a product that belongs on his "look into" list when making a purchase decision. —Richard Aarons



FACT FILE

The Smart Data Manager, Version 3.0

Innovative Software Inc.

9875 Widmer Rd., Lenexa, KS 66215; (800) GET-SMART; (913) 492-3800

List Price: \$495 Requires: 256K RAM, two disk drives, DOS 2.0 or later.

In Short: The *Smart Data Manager* is that rare animal: an integrated product that provides users with full relational database capabilities. It gives middle-level users support without being restrictive. Not copy protected.

CIRCLE 874 ON
READER SERVICE CARD

SDM takes the hassle out of report generation with prompted screens. Here, the user simply answers questions about page layout and *SDM* then builds the code in its own language for the report.

Page Information

Page length (in lines): 100
Page width (in characters): 80
Page number: 1
Start page number: 1
Left-right • Right-left • Bottom-right

Lines per inch: 60
Characters per inch: 12

IS THERE A PAGE ON THIS PAGE? Yes No
Location of upper left corner of form:
Line: 10
Column: 10
Location of lower right corner of form:
Line: 10
Column: 10

Is Loaded File Screen
TABEND standard

F1 Help F2 Edit text F3 Blank text F10 Finished
Search and F10 Printscreen F10 Cancel
ABORT = abort the delivery of tables on form

TAS (THE ACCOUNTING SOLUTION)

TAS (The Accounting Solution) is one of the less-expensive Category 3 programs in Project Database, and it manages to pack plenty of power into its small price and package. It performed well in our tests and you can quickly write dense and efficient code for custom applications, but you may want to consider its combination of features to make sure that it truly meets your needs.

As you will quickly find, *TAS* plays

■ PROGRAMMABLE RELATIONAL DATABASES

hardball when it comes to database development. It has a somewhat menu-driven facility to create or modify a database and there is a limited data entry screen that you can use to enter and view records, but from then on you are on your own. Grab your favorite text editor (none is included), whip up a few text files, run them through the program's compiler, and go back into TAS to run your application.

For those who haven't had the questionable pleasure, a compiler is a program that takes your text file of commands (the source code) and turns it into a format that the program can understand. Presumably, this makes the application run faster. The *TAS* compiler is fairly quick and provides clear error messages about syntax and other problems. You will want to redirect the output to your printer using the DOS facility, however, since there is no other way to get a printout of the compiler messages.

You will also want an editor that you can get to quickly, such as *SideKick*, or one that has a DOS shell facility, like *XyWrite*. The cycles of edit to compile to reedit, and edit to compile to test to reedit can get tiresome enough without having to wait for your editor to reload each time.

SKIMPY MANUAL. Even by the admission of a Business Tools Inc. representative, the single-volume manual is a bit skimpy. The written tutorial consists of creating a table and writing a short data screen program and two simple reports. I

■ Even by the admission of a Business Tools representative, *TAS's* single-volume manual is a bit skimpy.

found a few errors and misleading illustrations in the few pages that were there. The remainder of the manual is an alphabetical listing of the different commands with one or two examples each. One problem with the examples is that they do not show the commands in context with the other, related commands.

The examples would be helpful, since

TAS achieves its efficient coding by including two to four or more parameters with some commands. One command, *Trap*, has three parameters, the first of which has 14 different values to be used in different circumstances. Often, the last parameter is a label that directs the transfer of program control to another section of the program. *TAS* has most of the standard commands, including *If . . . Else*, *While*, *On (case1, case2 . . .)*, *Gosub*, *Goto*, and *For*. It has memory variables and memory management commands. There are simple string-handling functions available. The manual has no index, but since the reference section is the only useful portion, and that is in alphabetical order, the index is not as important as it might be.

Examples, such as the linking of multiple files, could make the job of learning TAS easier. The manual sheds little light on the subject, and when I called Business Tools, one representative suggested that I print out some of the source code for the accounting system reports (provided in Level 2 of the program) and see how they were done. I found these to be helpful, but not exactly ideal, instructional materials.

FEATURES There are no report or screen-generating utilities. You use similar techniques to create both, and reports can be sent to screen, printer, or disk. Unfortunately, if your report is wider than 80 columns and you try to display it on the screen, it does not wrap and the right portion of the report is lost from sight.

You can do sequential searches, add data entry verification, have footers on your reports, and import or export data files (quite rapidly as a matter of fact: 1.25 minutes for a 500-record file). All this and more is yours, but you will have to program each step of the way.

One Business Tools representative said that many of its customers are former *dBASE* users who prefer the power and brevity of *TAS* code. I know one such programmer who raves about this product. It is clearly a development tool, however, and not well suited to the casual user. In the current trend of adding "user-friendly" front ends to the high-power packages, *TAS* seems to head off in the other direction, offering high horsepower for a low price.—**Alfred Poor**



FACT FILE

TAS (The Accounting Solution), Level 2, Version 1.04

4038-B 128th Ave. SE; Bellevue, WA 98006; (800) 648-6258; (206) 644-2015
in Wash.

List Price: \$199 Requires: 128K RAM, two disk drives, DOS 2.0 or later.

In Short: TAS is a powerful and inexpensive applications development tool that can run on small systems, but it takes an experienced programmer to turn its potential into a truly useful system. Not core protected.

All files in TAS are managed through the use of a data dictionary. Since the information about fields and files is stored as records in other tables, creating tables can be slow.

BUSINESS TOOLS

Accounting Solution

SOLUTION

Table 1
Continued

100

[illegible]

New Use Grants

[illegible]

Y	N
N	N
N	N

陳	陳
陳	陳
陳	陳

100

```

Business Tools, Inc. The Accounting Solution V10m
-----
Data Dictionary Manager

Schema: PERSON Action: A Enter ? for help information)

Name      Type      Size      Cate      Dec      Only      Offset      Key      Up      Group
-----
EMPNO      A          3          3          N          1          V      M
EMPNAME     A          30         1          N          1          V      M
LASTNAME    A          15         1          N          15         V      M
EMPNO       A          6          6          N          30         V      M
ADDRESS     A          200        200         N          30         V      M
CITY        A          20         20         N          44         V      M
STREET      A          2          2          N          86         V      M
ZIP         A          5          5          N          88         V      M

```

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—Sol Libes,
Micro/Systems Journal,
January/February 1986

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PC Magazine,
February 25, 1986

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—*PC Magazine*,
Editor's Choice,
February 25, 1986

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—Jim Seymour,
PC Week,
August 13, 1985

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—*MIS Week,*
August 21, 1985

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October 29, 1985

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■ PROGRAMMABLE RELATIONAL DATABASES

TEAM-UP

Team-Up from Unlimited Processing Inc. is slick. Targeted to the lower- and middle-level user, *Team-Up* is completely menu-driven, loaded with help displays, and smooth in operation. It is easy to install, simple to learn, quick to execute your commands, and surprisingly powerful. *Team-Up* doesn't qualify as a power user's tool, since it lacks a DOS interface, a direct command syntax, and a properly developed procedural language. But if you do not need or want access to a free-form command line, the program is really great to work with.

The system comes on two floppy disks, and installation is neat and easy. Unlike some of the products in this review series, *Team-Up* does not generate scads of subdirectories, nor does it require the AN-SI.SYS driver in the PC version (the generic MS-DOS version does need it). A third floppy disk contains the extra-cost option Import Data utility. Why this, one of the very best import utilities I have seen, is packaged (and priced) separately escapes me; I would never use the package without it.

Configuring for color and printer setup entails simple picks from a list. I found the printer choices to be sort of skimpy, but you do have the option of providing exact escape sequences if you need to. All in all, installing *Team-Up* and completing the configuration process took me less than 10 minutes.

Team-Up gives you menus for everything you could ever want to do. They are clean and easy to work with, and dot-pathing lets the trained *Team-Up* operator jump directly from one point in the menu tree to another in one quick step. A pocket reference card lists major paths. During start-up, learning the number of menus can be confusing.

EASY SETUP Setting up the program to run the defined tasks was quicker with this package than with any of the others I tested. A full-screen editor is built into the system for painting entry/display screens, after which *Team-Up* prompts you for data about each display field. When you are done, you have defined both a screen for-



FACT FILE

Team-Up, Version 1.2

Unlimited Processing Inc.

8382 Baymeadow Rd., #8, Jacksonville, FL 32216; (904) 731-8330

List Price: \$795 single user; \$49 import option **Requires:** 256K RAM, hard disk drive, DOS 2.10 or later. **In Short:** A fast, easy-to-use menu-driven database management program with surprising power for low- and mid-level nonprogrammers. Not copy protected.

CIRCLE 87 ON READER SERVICE CARD

This busy display is used to define key fields and assign format/type/test attributes to fields. Walking through the process takes a long time, but it is really very simple.

mat and an initial database layout.

Team-Up will remind you to "enlarge" the new file before attempting entry operations. This helpful feature is found in several parts of the system. When your action alters a file structure, changes size, or modifies the index keys in any way, internal flags are set that will flash reminders to you of required maintenance. These same flags are also used to notify you that a maintenance function is not needed if you call it up in error. *Team-Up*'s thoughtful designers at Unlimited Processing Inc. definitely had the best interests of the user in mind. Easy to use is a label that fits this package perfectly.

The Import Data module is menu-driven with lots of options. It also will catalog a map of an imported ASCII file so that you can repeat the import with another file without repeating the dialog that was used to define it the first time. With only a single key field defined, I imported 500 records in 1.5 minutes (how's that for fast?). When I redefined the database to include five active keys, all to be indexed during the import, it then took 15 minutes to load the same 500 records—not great, but faster than most.

REPORT GENERATION/RECORD RETRIEVAL Report generation follows the general style of the rest of the package, and generating reports is so easy to do that I managed the reporting tasks without consulting the manual (unusual for a Category 3 product). By the time you have mastered the earlier steps, it just seems obvious how to do it. While screen design uses a nice full-screen editor, report/form design is accomplished through row/column notation. The program paints the image for you on the basis of your coordinate inputs; so you can see what is happening on each step. Users at any level—beginner to expert—would enjoy this process.

Team-Up was designed for multiuser environments, and the passwords and the security features that are integrated into the product show it. For the single-user PC, these features do not get in the way, nor does their description clutter up the manual.

Inquiry and record retrieval is of the "fill in the form" variety that has become so popular. Indexed retrieval of a specific record is faster than I can time by hand (under 1 second). Group selection takes a bit longer but displays a "one-liner" screen that allows you to browse through a direc-

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CIRCLE 254 ON READER SERVICE CARD

TABLE 1
COMPARISON CHART
RELATIVE RANK OF WP PACKAGES

FEATURE	WORDSTAR 2000 PLUS REL 2	MICROSOFT WORD VERS 2.0	WORD PERFECT VERS 4.1	MULTIMATE ADVANTAGE VERS. 3.5	DISPLAY- WRITE 3 VERS. 1.0
Installation	1	2	3	1	4
Documentation	1	2	2	2	3
Ease of Learning	1	2	3	1	4
Functionality	1	2	2	3	2
Performance	2	2	1	3	3
Document Control	1	3	2	4	1
Text Control	1	3	2	4	2
Page Control	2	1	3	2	2
Micro Editing	2	1	2	3	3
Global Control	1	2	3	3	3
Page Layout	2	1	3	2	3
Printing	3	3	2	3	4
Advanced Features	1	2	3	4	1
Writing Aids	3	1	2	2	4
Printers/Fonts Supported	1	3	3	3	3
Connectability	1	4	3	5	2

Note: The comparison numbers represent the relative ranking of each package compared to the others. The package with the highest ranking is given a 1. If packages rank equally, they are assigned the same ranking number.

Source: InfoCorp

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CIRCLE 534 ON READER SERVICE CARD

■ PROGRAMMABLE RELATIONAL DATABASES

tory of all the records that met the selection criteria. With one additional keystroke you can punch up any one of these records in full-screen-display format.

AND NOW THE BAD NEWS The procedural language is this system's only real weak point. It contains all the necessary language elements, but the format and the syntax are poor. Modern packages don't require that each line end with a semicolon or limit strings to ten characters. The language works just fine but needs work before it will fit with the rest of the system.

The documentation is bad news. The tutorial manual is the worst offender. Most of its pages are about half filled, and text-related pictorials are completely missing. In one section I scanned 81 pages before really getting into the topic at hand. I can't believe that the minds that built *Team-Up* are the same that produced these books.

The documentation aside, if you're looking for a tightly packaged, fast, easy database manager, give *Team-Up* a try. As long as you do not need to code your own programs and are content to stay within the menu environment, *Team-Up* is tops.

—John Phillips

10 BASE

Everything I know about software user interfaces told me that *10 Base* would be difficult to use. What a pleasure it was to find out I was wrong.

Fox Research's *10 Base* is an implementation of IBM's SQL, which stands for Structured Query Language and is most often pronounced "sequel." Fox Research also sells a multiuser version for its 10-NET local area network. Version 3 of *10 Base* (scheduled for a second-quarter 1986 release) will support other networks and add some enhancements to the program.

Most of your time using *10 Base* is spent in the SQL Editor, a nearly blank screen in which you enter, edit, and execute commands. For searching and reporting, a single Select command can encompass file and field specifications, search criteria, derivations, file relationships, and sorting. A single Select command can



FACT FILE

10 Base, Version 2.0

Fox Research Inc.

7005 Corporate Way: Dayton, OH 45459; (513) 433-2238;

List Price: \$495 Requires: 192K RAM, two double-sided disk drives or hard disk drive, DOS 2.0 or later. In Short: It's hard to beat this database manager's versatile editing commands when doing nonprogrammed reports on relational databases. Not copy protected.

ORACLE 606 ON READER SERVICE CARD

Going beyond the SQL Editor requires working with 10 Base's procedural language. The F1 key brings up your report; F5 returns you to the editor.

20 Negative Project Database III: 10-Base report

Dept #	Department	Employee	Salary
100	Accounting	Ames	\$20,000.00
100	Accounting	Benstrong	\$20,000.00
100	Accounting	Benadsky	\$45,000.00
100	Accounting	Betty	\$15,000.00
100	Accounting	Elia	\$15,000.00
100	Accounting	Evans	\$15,000.00
100	Accounting	Frady	\$15,000.00
100	Accounting	Grady	\$20,000.00
100	Accounting	Harun	\$15,000.00
100	Accounting	London	\$20,000.00
100	Accounting	Longley	\$15,000.00
100	Accounting	Ort	\$15,000.00
100	Accounting	Urtis	\$20,000.00
100	Accounting	Walsh	\$15,000.00
100	Accounting	Walton	\$15,000.00
100	Accounting	Finch	\$20,000.00
100	Accounting	Puller	\$15,000.00

F5-back F5-fore

grow to be quite complex, but you can start off simple. Press F1 to see results. Press F5 to go back to the editor. Expand or enhance your Select command and try it again. Add a Format command for column widths, headings, subtotals, and totals. Add a Print command to print results instead of displaying them.

The *10 Base* main menu has six options. The SQL Editor option lets you Create a file and Select, Modify, Insert, and Delete records. Picking Data Entry from the main menu brings up a standard entry screen. The other main-menu options are for sorting, file importing and exporting, and creating and processing customized forms for entering and printing files.

LANGUAGE PROBLEMS Although the SQL Editor commands are certainly versatile, some reports (such as the one required in the PC Magazine Labs testing script for database managers that fit Category 3) can be done only with *10 Base's* procedural language, and here there are definitely problems. The documentation is one source. The manual devotes only 41 pages—mostly examples—to the procedural language. While examples are help-

ful, they should supplement rather than replace good explanations.

10 Base's procedure language lets you add assignment statements, While loops, and If constructions to normal SQL commands. For generating a report with the procedural language, you'll probably start off with a Select command to pick out fields and group records. *10 Base* will store the results in a work file. Next, you'll implicitly read through this file record by record (much as you would with any other language), do your processing, and put the results in another temporary file that you define. Finally, another Select command prints out this final file. Although a program set up this way seemed awkward to me (and getting results took a long time), Fox Research technical support told me that my approach was reasonable.

INPUT PROCESSING The data input facilities in *10 Base* are very limited. Either you're stuck with the automatic form, in which case you have virtually no features at all or you're forced to work with the procedural language, where you can do much of your own input processing.

With some experimentation, you'll find

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The word processing software program found on the "approved" list of most major companies.

Corporate standard aside, MultiMate Advantage also lives up to people standards.

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For example, with the new columnar feature, creating up to eight columns on the screen is no longer wishful thinking.

Neither is printing those columns on a single page. In fact, MultiMate Advantage supports over 350 different printers.

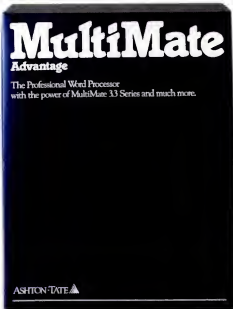
It also supports a new 40,000-word thesaurus. As well as a 110,000-word dictionary (complete with medical and legal jargon), which you can easily customize to include your own frequently used words.

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CIRCLE 210 ON READER SERVICE CARD

■ PROGRAMMABLE RELATIONAL DATABASES

that the speed and results of *10 Base* are often sensitive to indexing, presorting, and even the order in which you specify relations in the Select command. Fox Research technical support advised me to read the discussion on indexes in the manual "very slowly," for it contains much valuable information. Another chapter in the manual discussing other efficiency techniques would be a most welcome addition to the documentation.

Still, after I realized I could experiment to my heart's content within the SQL Editor without getting lost in a maze of menus, without losing anything, and yet being able to save my commands in files and later retrieve them, I had lots of fun with *10 Base*. When doing nonprogrammed reports on relational databases, *10 Base's* SQL Editor makes more "modern" menu-oriented programs look like primitive toys.—Charles Petzold

TSM

As the Monty Python troupe would say, "And now for something completely different." *TSM* (Transactional Systems Manager), from the Canadian software firm Dynabase, is a unique product with a refreshingly idiosyncratic view of data management. The design goal is to allow development of complete applications in less time than that required by traditional DBMs.

When *TSM's* ancestor was reviewed in the original Project Database 18 months ago, it was soundly criticized for its documentation, murky operation, and general strangeness. The new *TSM* addresses some of those weaknesses.

TSM is based on a dictionary structure for building field and file dictionaries. It executes "actions" that are the equivalent of other programs' functions or commands, then uses various tables to store these definitions and commands.

Luckily, *TSM* is not to be judged by its documentation, which continues to be a major disaster. It is very poorly written and organized, often confusing and murky, riddled with grammatical and punctuation errors, and contains several errors of fact.

Microcomputer documentation is slowly inching up from its horrid past, but the *TSM* manual is a throwback.

FOUR MODULES *TSM* consists of four primary program modules. The main module loads the other programs and accesses the Documentation Editor (which adds context-sensitive pop-up help windows). The Design Editor is used to create, edit, and manage the various table dictionaries that define an application; it also contains a layout feature that can paint screens and windows for data entry and reports. Defined applications are executed by the runtime module, which calls a secondary sort module when needed.

The main editor has a very intuitive box-drawing scheme that's easier to understand than most. Another attractive feature displays all the extended characters available on the PC and allows you to assign one to a function key for inclusion in screens. You can copy individual lines to other locations by line number, change margins easily, and even specify left and right justification. Available function key definitions are shown in a cluttered but functional box at the bottom of the screen.

DEFINING FIELDS Defining fields is straightforward. You simply specify field length, type, and any fixed character formatting you wish to add for alpha fields. Painting an input screen involves positioning the specific "actions" that perform the input function. This isn't particularly complicated, but the definition table that results is complex because *TSM* assigns cryptic numbers to each action.

Unexpectedly, only the first field in a file can be sorted (and is sorted automatically by *TSM*), but any other field can be indexed explicitly. This may strike experienced database users as somewhat strange, since most database products automatically index a field and then sort by command. All required constants must be defined in the Field Dictionary, after the real fields. There are no logical fields; the manual suggests that you set a constant field to "Y" to test against.

The Action Dictionary stores "command equivalents" that execute a program. These are six types of actions, with each action definition consisting of 11 parameters. However, some of the symbols used by the database program are nonstandard and confusing. You must also master



FACT FILE

TSM, Version 3.2

Dynabase Ltd.

51 Tannery St., Mississauga, Ontario, Canada; (416) 826-5141

List Price: \$49.95

DOS 2.0 or later.

In Short: An unusual, inexpensive, and effective database based on a dictionary structure that uses "actions" to create and organize a variety of applications.

Not copy protected.

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The Action Dictionary specifies the command actions necessary to create the Project Database report.

Action Dictionary										
DEFINITION DATABASE REPORT										
1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9	9
10	10	10	10	10	10	10	10	10	10	10
11	11	11	11	11	11	11	11	11	11	11
12	12	12	12	12	12	12	12	12	12	12
13	13	13	13	13	13	13	13	13	13	13
14	14	14	14	14	14	14	14	14	14	14
15	15	15	15	15	15	15	15	15	15	15
16	16	16	16	16	16	16	16	16	16	16
17	17	17	17	17	17	17	17	17	17	17
18	18	18	18	18	18	18	18	18	18	18
19	19	19	19	19	19	19	19	19	19	19
20	20	20	20	20	20	20	20	20	20	20
21	21	21	21	21	21	21	21	21	21	21
22	22	22	22	22	22	22	22	22	22	22
23	23	23	23	23	23	23	23	23	23	23
24	24	24	24	24	24	24	24	24	24	24
25	25	25	25	25	25	25	25	25	25	25
26	26	26	26	26	26	26	26	26	26	26
27	27	27	27	27	27	27	27	27	27	27
28	28	28	28	28	28	28	28	28	28	28
29	29	29	29	29	29	29	29	29	29	29
30	30	30	30	30	30	30	30	30	30	30
31	31	31	31	31	31	31	31	31	31	31
32	32	32	32	32	32	32	32	32	32	32
33	33	33	33	33	33	33	33	33	33	33
34	34	34	34	34	34	34	34	34	34	34
35	35	35	35	35	35	35	35	35	35	35
36	36	36	36	36	36	36	36	36	36	36
37	37	37	37	37	37	37	37	37	37	37
38	38	38	38	38	38	38	38	38	38	38
39	39	39	39	39	39	39	39	39	39	39
40	40	40	40	40	40	40	40	40	40	40
41	41	41	41	41	41	41	41	41	41	41
42	42	42	42	42	42	42	42	42	42	42
43	43	43	43	43	43	43	43	43	43	43
44	44	44	44	44	44	44	44	44	44	44
45	45	45	45	45	45	45	45	45	45	45
46	46	46	46	46	46	46	46	46	46	46
47	47	47	47	47	47	47	47	47	47	47
48	48	48	48	48	48	48	48	48	48	48
49	49	49	49	49	49	49	49	49	49	49
50	50	50	50	50	50	50	50	50	50	50
51	51	51	51	51	51	51	51	51	51	51
52	52	52	52	52	52	52	52	52	52	52
53	53	53	53	53	53	53	53	53	53	53
54	54	54	54	54	54	54	54	54	54	54
55	55	55	55	55	55	55	55	55	55	55
56	56	56	56	56	56	56	56	56	56	56
57	57	57	57	57	57	57	57	57	57	57
58	58	58	58	58	58	58	58	58	58	58
59	59	59	59	59	59	59	59	59	59	59
60	60	60	60	60	60	60	60	60	60	60
61	61	61	61	61	61	61	61	61	61	61
62	62	62	62	62	62	62	62	62	62	62
63	63	63	63	63	63	63	63	63	63	63
64	64	64	64	64	64	64	64	64	64	64
65	65	65	65	65	65	65	65	65	65	65
66	66	66	66	66	66	66	66	66	66	66
67	67	67	67	67	67	67	67	67	67	67
68	68	68	68	68	68	68	68	68	68	68
69	69	69	69	69	69	69	69	69	69	69
70	70	70	70	70	70	70	70	70	70	70
71	71	71	71	71	71	71	71	71	71	71
72	72	72	72	72	72	72	72	72	72	72
73	73	73	73	73	73	73	73	73	73	73
74	74	74	74	74	74	74	74	74	74	74
75	75	75	75	75	75	75	75	75	75	75
76	76	76	76	76	76	76	76	76	76	76
77	77	77	77	77	77	77	77	77	77	77
78	78	78	78	78	78	78	78	78	78	78
79	79	79	79	79	79	79	79	79	79	79
80	80	80	80	80	80	80	80	80	80	80
81	81	81	81	81	81	81	81	81	81	81
82	82	82	82	82	82	82	82	82	82	82
83	83	83	83	83	83	83	83	83	83	83
84	84	84	84	84	84	84	84	84	84	84
85	85	85	85	85	85	85	85	85	85	85
86	86	86	86	86	86	86	86	86	86	86
87	87	87	87	87	87	87	87	87	87	87
88	88	88	88	88	88	88	88	88	88	88
89	89	89	89	89	89	89	89	89	89	89
90	90	90	90	90	90	90	90	90	90	90
91	91	91	91	91	91	91	91	91	91	91
92	92	92	92	92	92	92	92	92	92	92
93	93	93	93	93	93	93	93	93	93	93
94	94	94	94	94	94	94	94	94	94	94
95	95	95	95	95	95	95	95	95	95	95
96	96	96	96	96	96	96	96	96	96	96
97	97	97	97	97	97	97	97	97	97	97
98	98	98	98	98	98	98	98	98	98	98
99	99	99	99	99	99	99	99	99	99	99
100	100	100	100	100	100	100	100	100	100	100

Get the Picture with COLORPHOTOBASE



PHOTOBASE is a software package that works with data base management systems such as: dBase II*, R-Base 4000* and the IBM Filing Assistant*.



PC-EYE is a high speed, high resolution video digitizer board that lets you capture anything you can see.

Now you can open up a whole new dimension in data base applications by merging real-life color pictures with popular data base management systems. Pictures of people, products, diagrams, maps, company logos — whatever you want to photograph — can be integrated with your data base. Consider these typical applications:

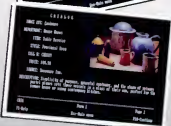
Security — verify those employees who have authorized clearance to limited access areas. A data base containing employee pictures and personnel records can be searched and displayed for visual verification.

Real Estate — add pictures of houses to on-line real estate listings for faster property identification and improved sales presentations.

Electronic Cataloging — pictures of products can be combined with a data base system containing product specifications, pricing, availability and much more.

Medical Files — Existing data base systems containing patient histories can incorporate pictures of x-rays, cell slides and external body disorders. The ability to visually inspect previous medical problems of patients can greatly enhance the speed and accuracy of future diagnosis.

Customers, distributors and sales personnel can quickly search data and view the resulting product/picture information on one screen. Files can be updated easily, quickly.



It's Easy

With a simple keystroke, pop-out of your data base system and into the PHOTOBASE menu. Capture images of text, photos, artwork and 3-dimensional objects with an ordinary video camera and our high resolution PC-EYE™ video digitizer. Pop back into your data base system and add the picture name to your data base like you would any other piece of information. The full functionality of the data base system is preserved, but the resulting display is text and picture information on one screen.

Pictures are displayed in the upper right quadrant of the screen or at a full screen resolution of 320 x 200 with 256 optimized colors. Screen display can alternate with text, images, or both simultaneously viewed.

Call or write and we will send you information on PHOTOBASE, PC-EYE, compatible cameras and other imaging equipment in the Chorus Family of products.

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1-800-0CHORUS.**

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CIRCLE 107 ON READER SERVICE CARD

CHORUS

■ PROGRAMMABLE RELATIONAL DATABASES

a somewhat cryptic subroutine numbering scheme.

MASTERING THE SYSTEM On a brighter note, flexible control mechanisms handle record extraction, print control, and other aspects of common data management functions. In fact, the more the system's peculiarities are mastered, the more powerful it seems.

Programming the sample report required a lengthy call to Dynabase. The personal attention the company gave greatly aided learning the system; to some degree the manual makes *TSM* seem even odder than it really is. Execution speeds were not exciting but were in the same ball park as many competitive products.

Dynabase includes a library of finished applications constructed with *TSM* that performed impressively (this library is offered for sale separately). When you buy *TSM*, you are given full distribution rights, with no royalties or run-time modules needed.

TSM can perform serious data management, but the learning curve, even for experienced users, is steep (and would be steep even with a much better manual). Once mastered, though, *TSM* can generate effective transactional applications with less effort than some more traditional database managers. It's also very inexpensive at \$49.95. If the manual is overhauled and you have a taste for the unusual, *TSM* is worth a look. It will show you that there is definitely more than one way to skin the database management cat. —**Glen Hart**

VERSAFORM XL

Designed for the novice computer user who wants to organize routine office paperwork into a manageable form quickly, *VersaForm XL* is a powerful database package that serves its intended audience well. Both its low price and its user friendliness make it a good introduction to many advanced database concepts while still performing many useful functions.

VersaForm XL interacts with you by using a series of menus and screen prompts. To define a form, you select the Form Design option from the main menu.

VersaForm XL's design menu then asks you if you want to design, change, or copy a form. It also allows you to specify different checking and automatic filling options that will be applied to the data when it is entered into the form.

The Filing module handles data entry functions. It displays a form template on the screen and allows you to enter or edit the data in the form. The Report function, which fulfills most printout needs, provides the finished product.

CUSTOMIZED PROGRAMS If any of *VersaForm XL's* modules do not adequately suit your needs, you can use the program's procedure language to build customized filing and report programs. Although this added functionality may prove to be very handy, a more sophisticated database program may be what's called for if your needs are more advanced.

A couple of things make *VersaForm XL* especially nice to work with. It has a handy calculator function that you can use to perform quick computations during data entry and editing. *VersaForm XL*'s calculator can compute values from the database itself, and the program can insert results

back into the data. Another convenient feature is the program's mailing-label-handling procedure; some users will find it alone worth the full price of the package.

As part of Applied Software Technology's pricing policy, for \$1 (to defray handling and postage) it is sending users a booklet of sample forms that can be adapted for a variety of business applications.

BORDERLINE During the PC Magazine Labs tests I consistently found that *VersaForm XL* hovered on the borderline between Categories 2 and 3. In a sense, that dichotomy was evident in the program's implementation. Although *VersaForm XL* has a good procedural language, it is severely limited by its inability to handle nonunique index key values.

In addition, while *VersaForm XL*'s perfect-bound manual is clear and concise about most aspects of the package, it is at the expense of more robust on-screen documentation. These points may be due to *VersaForm XL*'s origins as a form-based program rather than a fully structured database manager. But *VersaForm XL*'s \$99 price tag more than makes up for any deficiencies. —**Bill Harts**

FACT FILE

VersaForm XL, Version 3.23

Applied Software Technology
1350 Dell Ave., #206; Campbell, CA 95009; (408) 370-7599; (408) 370-2662

List Price: \$99 **Requires:** 192K RAM, two disk drives, DOS 2.0 or later.
In Short: This low-cost but powerful database has much to offer for handling routine database management; but even though it has a good procedural language, VersaForm XL is limited by its inability to handle nonunique index key values.
 Not copy protected.

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The screenshot shows the 'REPORT DEFINITION' menu for 'Form 14: VOUCHERS'. The menu options are: Title, Library, Report by, Department, Special, paper size, Width, Length, Report, and Print-Items. The 'Print-Items' option is selected, leading to a list of items to be printed: NAME, SEX, SSNO, DATE, NAME, and SALARY. Below the menu, there is a note: 'To change these instructions, use the command FILL. When everything is OK, command SAVE.' At the bottom, the command sequence is shown: 'OD:..... ? , N , SA , M , CL , E , PF , PR , PR , R , 4'.

The report definition menu used to produce one of the PC Magazine Labs test reports.

ZIM

Zim is a powerful database management/applications development system designed according to the newest theory in database design—the entity set.

In **Zim**'s unique relationship model, records are considered entities. For example, a file can be filled with entities called "salesmen" in one case and "orders" in another. Each salesman in the salesman file may have one or more orders in the order file. In order to link these files in the entity-relation model, you tell **Zim** which entities are related, how they are related, and then name the relationship. In this case a good name for the relation between entities "salesmen" and "orders" might be "write." Not only is it easy to remember, but it shows the direction of the relationship: salesmen write orders, but orders don't write salesmen.

RECURSIVE LINKS With these entity sets, the applications designer can do much that is not possible with a traditional relational database, including recursive links and handling many-to-many relations.

Zim's documentation is to the point—brisk, but accurate and readable. Although

■ With **Zim**, the applications designer can do much that is not possible with a traditional relational database.

some theoretical concepts are covered, the documentation pretty much assumes that the user is familiar with both the theory of entity sets and the theory of structured programming.

Zim has an excellent on-line tutorial; however, you cannot master this software package with the on-line tutorial alone. **Zim** is in effect a programming language that happens to handle files automatically.



FACT FILE

Zim, Version 2.5

Zantre Information Inc.

1200-38 Antares Dr.; Nepean, Ontario, Canada K2E 7V2; (800) 267-9972; (613) 727-1397

List Price: \$795

Requires: 386K RAM, two disk drives, DOS 2.0 or later.

In Short: A high-level applications generator that uses the recently developed

"entity set theory" to organize

information.

Copy protected.

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Zim uses the entity set/relation model. This improved approach to relational databases uses named relations as shown here in the Zim tutorial.

--- Screen 8.8 --- ZIM INTERACTIVE TUTORIAL --- Page 8 of 27 ---

The FIND command above produced a logical entity set (called a "composite set") comprised of related records from INVOICES and CUSTOMERS. Each "member" of this composite set consists of a single record from INVOICES and a related record from CUSTOMERS. The customer in this case is always the Hardware company; logically, the set looks like:

InvNum	CostCode	InvDate	...	Company	CostCode	FirstName	...
9999	10001	19940112	...	Hardware	10001	John	...
1043	10001	19950301	...	Hardware	10001	John	...
...

10001 ← 100000 9999 1994 0112 9999 1994 0001 0001 ← 0001

Thus, you would have to learn the **Zim** language just like any other if you wish to use all the power of this package.

The product is meant for the serious applications designer. Complete applications, including menus, forms, and customized user routines, can be developed using **Zim**. Routines can be compiled for compact storage and fast execution. **Zim** also enables you to create your own command set, which can be used along with **Zim**'s own commands in special applications.

Zim uses forms for screen and other I/O. In a typical database application, entities and relations are established, forms are created, and a program is written that ties all these factors together. Related files are tracked by the system with internal data dictionaries and directories. Despite these complicated structures, database modification is quick and accomplished in most cases with two commands.

RICH WITH ARITHMETIC **Zim**'s programming language is highly structured and uses procedures and libraries. Procedures can pass arguments and use local variables. **Zim** is rich with arithmetic

(trig, transcendental, hyperbolic, and exponential) and string-handling functions (general character, blank trimming, data positioning, case translation, and masking). Control structures include While... Endwhile, and If... Else... Endif. The programming language also includes a full report-writing code. **Zim** can use its own error trapping, or you can trap errors and customize error messages yourself.

Zim's security option provides security to the field level or your own security routines. **Zim** allows you to use your favorite line editor from within the **Zim** environment. The program comes with several powerful utilities that use menu prompts to guide you through the creation of entities, relations, forms, and elementary programs. These utilities actually generate source code, which can be enhanced by the user and compiled. (Its own security arrangement is flexible as well: although **Zim** is protected with a key disk, its publishers provide special contacts for hard disk users who find the key disk impractical.)

In the end, **Zim** is an excellent, workmanlike product. It's not pretty, but it does its job extraordinarily well.

—Richard Aarons

**PROJECT
DATA II
BASE II**

Relational databases have become easy to use—the products reviewed here don't require that you learn programming in order to take advantage of their powerful capabilities.

RELATIONAL DATABASES

Using an ordinary flat-file database manager can be incredibly helpful when it comes to organizing your business or personal life. But as your database needs grow and change, you'll likely find yourself needing something slightly more powerful than those simple products—a relational database manager.

Relational database managers are far more suitable for business applications. For example, a flat-file product's file definition may require you to enter the same data several times or more in order to complete individual records. Relational database products, on the other hand, incorporate a more advanced type of file design that obliges you to enter the data only once. Relational database products give you a considerable advantage because they permit files to be linked together in such a way that common information can be accessed by a large number of records in one or more additional files—something that is technically impossible using run-of-the-mill flat-file products.

Not long ago, using relational databases meant coping with the complexities of programmable relational database products like those covered in the previous section of this issue. Today, however, you can use products that are easy to understand and learn, and in some cases more powerful than their programmable brethren. Some of these non-programmable relational database products have even been adopted by the consulting community. There's a better-than-even chance that you'll find a product to fulfill your needs among the 24 reviewed in this section.—**John Dickinson**



RELATIONAL DATABASES

[illegible]

LEGEND: ∞: unlimited NA: not applicable LC—Limited by machine capacity NFL—No field limit *—Timed using 25 records only



—Indicates Editor's Choice

Data Input/Export	Data Manipulation	Command Strategy			Disk Requirements			Support Material			
		Static menus with:	Dynamic menus with:	Typed commands	Number of distribution diskettes		Tutorial				
Automatic data entry Calculated fields on entry screen Carryover data from previous record Error processing	ASDII DIF ORF PFS SDF SYLK WKS User defined Indexing Number of index files Compound indexes Index values must be unique Can respectify indexed field(s) Can respectify file delimiton Sorting Number of sort fields Ascending order Descending order Maximum number of open files Multiple record deletions and updates Main updates Text updates Table merging Maximum number of tables merged	Function keys Ctrl or Alt key combinations "Point to command, press Enter" Specified single key Function keys Ctrl or Alt key combinations "Point to command, press Enter" Specified single key Whole words Abbreviations Mouse/other input device Floppy disk Hard disk Kbytes occupied by program files									
	192	512	32	32			300	1	1	★ ★ ★	■
	24	24	∞	8			124	1	1	★★ ★	■
	158	∞	32	NA			575	5	1	★★ ★★	■
	6	∞	∞	NA			350	3	1	★★ ★	■
	5	NA	9	9			1MB	5	3	★ ★	■
	65	10	10	NA			180	1	1	★★ ★	■
	23	NA	276	12			460	3	2	★★ ★★	■
	NFL	25	3	NA			350	3	1	K ★★ ★★	■
	200	200	12	∞			650	3	2	★★ ★★	■
	∞	∞	3	2			320	4	2	★★ ★★	■
	20	3	9	NA			272	5	2	★ ★★	■
	3	9	2	2			244	2	1	★ ★★	■
	99	NA	NA	5	5		K 960	3	3	★	■
	NA	50	5	50			720	2	2	★★ ★★	■
	13	5	2	2			115042	1	1	★ ★	■
	42	10	42	43			340	1	1	★★ ★★	■
	∞	10	10	NA			888	5	2	★★ ★★	■
	∞	∞	20	20			600K	5	4	★★ ★★	■
	∞	∞	∞	100			11MB	13	4	K ★	■
	16	NA	NA	NA	16		11MB	8	4	★ ★	■
	∞	10	40	40			237	3	2	★★ ★	■
	5	∞	5	5			1MB	4	3	★★	■
	5	9	12	12			1MB	4	4	★★ ★★	■
	∞	64	14	12			1.2MB	4	1	★★ ★★	■

◆—Indicates that product is a database compiler ☐ no import or export ☒ import ☐ export ☒ both import and export K—Key disk *poor ‡average ††good †††excellent

RELATIONAL DATABASES

PRODUCT NAME	Input Facilities			Output Facilities			Special Feature			High-level language interface
	Screen definition	Report generation	Report definition method	Output reports to:	Query language					
	Prompting Coordinate specification Automatic Programming Number of screens per file Number of files per screen Prompt messages for fields Arithmetic functions Aggregate functions Statistical functions Multiple file reports Predefined mailing labels Printing Form layout Automatic Programming Stored report definitions Headers Footers Printer Printer setup facility Screen On-line Multiple file access Stored queries Boolean expressions Phonetic searching Global searches DOS 2.0 directory support Change default directory Access from another directory Macros Customize keyboard Customize color screen User access security provisions Data encryption BASIC Pascal C FORTRAN FORTRAN Assembler Proprietary high-level language									
Aladin	■	64	1	■	■	■	■	■	■	■
Btrieve	■	■	■	■	■	■	■	■	■	■
Cornerstone	■	255	1	■	■	■	■	■	■	■
DataFlex	■	■	250	■	■	■	■	■	■	■
Day One	■	9	9	■	■	■	■	■	■	■
DB-FABS	■	1	1	■	■	■	■	■	■	■
PC-Enrich	■	1	12	■	■	■	■	■	■	■
Files & Folders	■	1	1	■	■	■	■	■	■	■
PC-Formula IV	■	■	12	■	■	■	■	■	■	■
Integrated 7	■	5	1	■	■	■	■	■	■	■
Kaleidoscope	■	1	1	■	■	■	■	■	■	■
KeepIT	■	9	1	■	■	■	■	■	■	■
MAG/base 2	■	1	1	■	■	■	■	■	■	■
Manager	■	6	5	■	■	■	■	■	■	■
PC-DBMS	■	1	1	■	■	■	■	■	■	■
PC-File/R	■	1	1	■	■	■	■	■	■	■
Personal Pearl	■	9	10	■	■	■	■	■	■	■
PC-Power-base	■	1	1	■	■	■	■	■	■	■
Prodas	■	■	■	■	■	■	■	■	■	■
QINT/SQL	■	■	■	■	■	■	■	■	■	■
R:base Series 4000	■	■	1	■	■	■	■	■	■	■
RTFILE	■	■	1	■	■	■	■	■	■	■
SIX	■	■	12	■	■	■	■	■	■	■
XDB	■	4	10	■	■	■	■	■	■	■

LEGEND: ■: unlimited ◆: Indicates that product is a database compiler PC: Indicates Editor's Choice

A CRUSHING STORY

PC MAGAZINE INSERTED OUR PROGRAM In their April 15th Issue.

Last month almost 300,000 of you received a fully functional copy of Brown Bag Software's popular word processor through the unique disk-insert offer in PC MAGAZINE. So far, the response to the "try and buy" insert has been overwhelming and many of you have purchased the program by calling our toll-free number. We're very excited about the success of this promotion and proud to participate in this innovative approach to software distribution.



Are you suffering from a slipped disk?

Due to the unique packaging and handling procedures used for the special disk-insert, some of the disks may have been slightly damaged. If you've received a "slipped" disk your copy will not rotate within the disk jacket and was probably crushed during the handling of the magazine. Since we wouldn't want you to miss out on this

opportunity to test the program for free, try the following remedies to get your disk back on track.

1. Hold your disk by its edges and rap all four sides **sharply** against a flat surface several times. (illustration)
2. Hold your disk and scrape all four edges firmly against the edge of a table. Make sure that you don't touch the disk media inside. (illustration)

If these remedies don't work, we'd be


happy to replace any non-working disks immediately.

Call our toll-free number:

800-523-0764. If the lines are busy or you are calling from within California call **408-559-4545**. Please make sure you have the serial number of your disk handy. We're here to support you seven days a week. Support hours are from 6:00 am-6:00 pm (Pacific Time) Monday through Friday and from 9:00 am-5:00 pm on weekends.



BROWN BAG SOFTWARE
"REPLACEMENT OFFER"
2105 South Bascom Ave.
Suite 184
Campbell, CA 95008



We've got your word processing problems all wrapped up.

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- **Does Windows** Again, this feature alone could cost you way over \$89. Edit two parts of one document at the same time, or two different documents concurrently.
- **175-page Operator's Manual** includes tutorial, detailed documentation and an extensive technical reference section.

■ **Free telephone support** 7 days a week. From 6AM-6PM Monday through Friday and 9AM-5PM on weekends. (Pacific Time)

■ **Keyboard Macros** Redefine the keyboard as you wish. Assign "boilerplate" to a single key.

■ **Spelling Checker** Checks spelling and learns new words.

■ **Nine On-Line Help Screens** To assist you.

■ **Powerful Editing Features** Including some not even found in packages costing five times as much. Here are just some of them:

- ☐ Multiple-line headers, trailers and footers
- ☐ Automatic generation of index/table of contents
- ☐ Global search and replace (including "wild-cards")
- ☐ Permanent and temporary margins
- ☐ Justify right and/left (or not at all)
- ☐ Center text
- ☐ Move copy and delete blocks (cut-and-paste)
- ☐ "Undo" command
- ☐ Unlimited line length
- ☐ Produces ASCII text files
- ☐ Defaults to WordStar™ cursor controls
- ☐ Can use WordStar™ files
- ☐ And much, much more!

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If the lines are busy or you are calling from within California call

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(Apple II and Commodore 64 users we've got something for you too! Please call for details.)

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PC EDITOR'S CHOICE

The unquestionable winner in the relational database race is *Powerbase* from CompuWare Corp. This easy-to-learn, easy-to-use program contains so many powerful features that reviewer Dick Aarons feels that it doesn't need to be programmable and that its DataZoom feature, which links several levels of numerous files together through related fields, is alone worth its price.

Runners-up include Migent Software's *Enrich*, a friendly, well-documented, and fully functional database that aims at the nonprogramming business user without sacrificing flexibility.

Also deserving the nod is *Formula IV*, by Dynamic Microprocess Associates, an extremely powerful system that includes, among many features, a multiuser capability that doesn't require any extra network hardware.

ALADIN

In the tale from *1001 Arabian Nights*, Aladin was the lucky lad who found a genie by rubbing an old and tarnished lamp. Depending on your wish list, you may find some magical power inside this modern namesake product.

This non-copy-protected program is firmly a Category 2 package. It relates multiple files cleanly and intuitively but has no procedural language capabilities (though they are available through an extra option). It does have a macro facility that uses "scripts," so that you can store keystroke sequences to provide limited automation of repetitive tasks.

One of its most unique features is its statistics functions. With most database programs, statistical support means that you can generate averages, counts, minimum, maximum, and perhaps even a weighted average if you are lucky. This program performs these traditional "summation analysis" tasks but goes on to provide "frequency analysis." This latter feature lets you get a table (or histogram) showing how many of your records fall into different ranges, such as number of items with profit rates of 0 to 25 percent, 26 to 50 percent, 51 to 75 percent, and 76 to 100 percent. You can even do multidimensional evaluations. If that is not enough, *Aladin* has a variety of more esoteric statistic functions built in, including chi square, standard and mean deviations, and Pearson coefficient for linear regression.

Installation is a snap: just copy the disks onto your hard disk and go. Once you get into the program, you find that the system is almost entirely driven by function key commands. The choices are always displayed across the bottom line of the screen, so you always know what your options are. If you don't know what the options mean, then on-line help is usually available.

EASY PROMPT TRANSLATION I thought at first that I would not be comfortable translating ten horizontal prompts into something meaningful about the two vertical sets of five function keys on my PC keyboard, but I soon found that it was no

problem. One reason for this was that the same keys are almost always used for the same function. For example, Yes is always assigned to F6 and No to F8. It is a little confusing because F6 and F8 have other assignments on other screens, but it is not as difficult to get used to as the strange assignment of some keys ("move left" and "move right" are not on adjacent keys, which defies logical explanation). F1 is always Cancel or Done, which makes it easy to get out of a series of choices, but it is also Exit, so if you should sit on it too long or hit it frantically as a report runs out of control, you will find yourself sitting in DOS before you know it.

Some of *Aladin's* features fight its ease of use. Perhaps the biggest culprit is the fact that it exists as two separate modules. You must use one to create new files, reports, or data-entry screens. You then go back to DOS and reenter through a different module to do data entry and queries.

File creation has some strange quirks that can cause problems. The first is that you may not halt the definition process at any point without losing all the work done to that point. Another strange detail is that *Aladin* not only preallocates space for data and key files but also asks the operator to decide how much space to allocate. Normally, these things are handled dynamically by the program, so that the user is insulated from the gory details of available disk space and so forth. *Aladin* not only does not do this for you, it also forces you to make your decision in terms of "disk blocks," instead of the more familiar byte. I agree that users should take some responsibility for knowing their system, but this seems unnecessary.

DOCUMENTATION The documentation is fairly good. There are many pages of "documentation clarification" stuck in the front of the manual, which is a little confusing to read before you know what the program is about. For those who wish to try something a little sparser than the eight-chapter tutorial, there is a 25-page section optimistically titled "*Aladin* in an Hour." I've done this sort of thing before, and I took nearly an hour and a half to cover the 25 pages, but the concept was sound. You do get a good overview of the package's features, including some

■ RELATIONAL DATABASES



FACT FILE

Aladin, Version 2.6

Advanced Data Institute Inc.

8001 Frautridge Rd.; Sacramento, CA 95820; (916) 381-8334

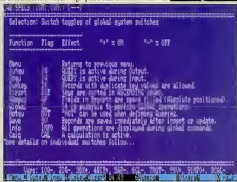
List Price: \$795 **Requires:** 192K RAM, two disk drives, DOS 2.0 or later.

In Short: *Aladin* is above average in the statistics department, containing both traditional and more esoteric calculations, but its high price and lack of other

features limit its appeal to a narrow range of applications. Not copy protected.

CIRCLE 612 ON
READER SERVICE CARD

Aladin has many software toggles to control the way the program functions. This screen shows the cryptic prompts on the next to the last line and the function key labels used to change the settings.



sophisticated details.

The reference section is organized along the same lines as the branching menu structure. Without tabbed dividers, it can be difficult to find what you need. There is an index, but after a half-dozen attempts to find different items, I gave up on it entirely. It is not thorough enough to be much help.

MORE QUIRKS File importing shows more of *Aladin*'s quirks. The manual says that you can import standard ASCII form files and then goes on to describe a nearly unique format requirement: fixed-length, delimited field records. The delimiting character can be just about anything, but in the tutorial example, a file is produced and used that uses a carriage return between each field as well as each record. I have seen this before but not often. This meant that I had to massage our fixed-length record files in order to make them palatable to *Aladin*.

The import was slow, and I had all sorts of difficulty importing the salary fields. It took a few passes to find a combination of formatting and field definition that would work. Once I finally got the import work-

ing on this third and final file, I was dumped with the error message that I had exceeded the "tree file" space. Accepting the default suggestions offered by *Aladin* at file creation time had apparently not been sufficient. When I went to enlarge the file, the display appeared to say that no more disk space was available (which I knew to be false). I reset the numbers to higher values and then tried the import again. Before I could, I had to rebuild the index table (another slow process), and finally the salaries came in. All the imports gave an error message on the final record, but the data appeared to have come in cleanly.

Aladin has its roots in Pascal and the p-system and shows its age. It uses bizarre filename conventions, limiting you to a total of eight characters for database and filenames and to three-letter report and query names that end up being used as file extensions. I prefer to have my file extensions the same according to file category; it helps to make management easier. Seeing a file ending with .R1 and knowing that it is a report of some sort is not too helpful because I have no way of knowing just which report it might be.

Aladin will fill the bill if you need a program with limited power but capable of some distribution analysis calculations or other statistics. It is no speed demon, but its gremlins and obstinate ways of doing things may be worth the results in specialized situations. As a general-purpose database, however, I think the competition offers more speed, power, and flexibility for a lower investment of time and money.

—Alfred Poor

BTRIEVE, RTRIEVE, XTRIEVE

The three companion programs—*Btrieve*, *Rtrieve*, and *Xtrieve*—from SoftCraft Inc. are like the commercial in which the guy opens his medicine cabinet only to find another guy (and his wife) on the other side.

Btrieve files are in the medicine cabinet. On one side stands the programmer working in various brands of microcomputer languages—compatible COBOL, BASIC, C, APL, Pascal, Modula-2, or Assembly. He may manipulate *Btrieve* files using *Btrieve* routines that, once incorporated into the programming language, look like 31 new database-type commands.

The neighbor and his wife are on the other side—*Xtrieve* and *Rtrieve*—permitting the nonprogrammer to manipulate the same *Btrieve* files using a menu-driven front end. *Xtrieve* is for editing, sorting, importing, indexing, and keying *Btrieve* files, while *Rtrieve* is for interactively designing and outpouting reports.

A PROPER ENVIRONMENT NEEDED. The real strength of *Btrieve*,

Xtrieve, and Rtrieve is best seen in the proper environment. (Btrieve/N, Xtrieve/N, and Rtrieve/N support the Novell and IBM PC networks, among others.) Both versions will run under XENIX. You can get a multiuser shell for Btrieve called *BMulti*, which supports IBM's *TopView*, as well as Software Link's *MultiLink* and *MultiLink Advanced*.

I don't recommend using *Xtrieve* and *Rtrieve* as a standalone interactive database program. Their menu structure is unclear (some items are optional, others

mandatory within the same menu). Moreover, since data is kept not in memory but on disk, every time you rearrange a table, the program goes to disk to get the records to display. If you change the indexes on a data file, you must reimport the data back into *Xtrieve* to make the indexes active. If you change a report specification in *Rtrieve* and want to display to screen before printing, all data must be read into memory from disk again. This means a big trade-off in speed for economy of storage space.

Since the lengthy disk access for most procedures takes the fun out of interactive fine-tuning, I would leave such work up to the macro facility (the "Command" command). These macros can be edited as ASCII files by any text editor. However, the design of your database should be well thought out beforehand, or the task might best be left to an in-house programmer.

PROGRAM ENHANCEMENTS Enhancements in the current version of *Btrieve* include encryption procedures for individual records within a file and variable-length fields. Since the single-user versions of these programs are upwardly

compatible with the network versions, network applications can be developed in the former and run with no changes to the code. *Btrieve* has special storage routines for economy of space, and all keys are automatically maintained. Commands in an application can be bundled as "transaction groupings" such that either all or none are performed.

Each table may have up to 24 keys (segmented or not), and up to eight tables may be joined at a time. The default sort is on ASCII order, but this can be user-defined to obtain sorts in languages with special characters such as German, Swedish, or Finnish.

TUTORIALS HELPFUL BUT NOT SUPERB *Xtrieve* and *Rtrieve* both have interactive on-disk tutorials. Put these in separate directories if you're using a hard disk; otherwise they confuse each other's data files. The tutorials are helpful but not superb; you can crash them by not paying attention to the prompts, and at times they are less than lucid. The *Rtrieve* tutorial would benefit by having side-by-side illustrations of report formats and the actual reports generated by them. The same mild

awkwardness is true of the manuals. Only the *Btrieve* manual has an index, but its best feature is its copious examples of most of the commands in all of the programming languages it supports.

SoftCraft Inc. has a bulletin board at (512) 346-8385, up on weekdays from 6 p.m. to 8 a.m. (Central Standard Time) and all weekend. This could be a good source of information for potential buyers of SoftCraft products. New users get free, unlimited telephone support for a month and then can opt to pay for other support plans. If you already have on hand a lot of code in the languages mentioned above and want to add database capabilities accessible by both programmer and the comfortable-with-menus average user, then a look at *Btrieve*, *Rtrieve*, and *Xtrieve* may be worth your while. —Phoebe Schmidt

CORNERSTONE

Infocom, a company better known for entertainment programs than for business software, has made some changes to *Cornerstone* since I previously tested the database. The most dramatic is a nearly \$400 price cut, bringing the price down to \$99.95. The company has abandoned the unique flip-top plastic box with three manuals for a single, paperbound, consolidated manual. Other than that, the \$99.95 program is the same as the \$495 program PC Magazine Labs tested.

At \$99.95, *Cornerstone* is an appealing package. The database has very flexible file definitions (you can change your mind without redoing your files), including an unusual "subfile" implementation. The program's weaknesses are mostly its awkward report definition and sluggish reporting speed.

Cornerstone's command strategy combines a command line with a menu. You can type whole-word commands if you like, construct commands word by word by pressing the Space bar at the menu options, or use a combination of the two methods. Typing the first letter or two of a word shrinks the menu down so that you can finish off the word by pressing the Space bar.

Displaying a report that uses multiple



FACT FILE

Btrieve, Version 3.15

SoftCraft Inc.

P.O. Box 9802, #917; Austin, TX 78766; (512) 346-8380

List Price: *Btrieve*: \$245; *Xtrieve*: \$195; *Rtrieve*: \$85

Requires: 128K

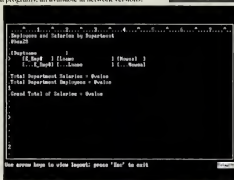
RAM, two disk drives, DOS 2.0 or later

In Short: Three companion programs, all available in network versions:

Btrieve, the programmer-manipulated database, can access up to 4 gigabytes of memory; *Xtrieve* allows the nonprogrammer to edit, sort, import, index, and key *Btrieve* files, while *Rtrieve* is for nonprogrammers who want to interactively design and output reports. Not copy protected.

Circle 626 on Reader Service Card

A report specification in *Rtrieve* showing the layout of a set of *Btrieve* files.



■ RELATIONAL DATABASES

files has several prerequisites. You must first set up a relationship between the linked fields of each file. In the "define-attributes" menu, you simply indicate that a field (or, in *Cornerstone's* lingo, an attribute) in one file is the same as a field in another file. You should also indicate that these fields have unique values (though I found out that *Cornerstone* will not balk but only slow down if you don't), and the fields should be indexed.

Next, in the primary file that contributes to the report, you must define additional derived fields for the information that comes from the other files. These fields will not actually contain data, but you can use them in your report definition the same as any other field in your file.

REDEFINING YOUR DATABASE

Since you probably won't think of all these things when you first define your files (I certainly didn't), *Cornerstone's* flexibility in redefining a database later is a lifesaver. The only real restriction is that you can't change the field type (numeric, string, and so forth) after you've entered data into the file. Otherwise you have almost complete freedom to change the maximum field

length, delete or add fields, and change other characteristics.

Cornerstone also includes a subfile provision that for some applications could be a convenient alternative to using relational files. For instance, if you want to keep track of various purchases by different

■ Pressing the F1 key brings up a screen's worth of contextual help information, but it's the slowest I've ever seen.

companies you sell to, the normal relational method requires keeping the company information in one file and the purchase information in another and setting up a relationship by company name or code. With *Cornerstone*, however, you could make a subfile with the purchase information within the company information file. Each purchase would occupy one subrecord in

this subfile. The program gives you the space savings of relational files with the convenience and speed of using just one file.


The worst speed problem I encountered in *Cornerstone* was during definition of the columnar report required by the PC Labs testing script. At each step of defining the report (including sorting the file, calculating subtotals, and calculating totals), *Cornerstone* insisted on actually doing the chore before it would let me proceed with the rest of the definition. Since I hadn't properly indexed all the fields I should have, the original definition of the report required about 2 hours, most of which were taken up by disk churning. Indexing those fields speeded things up considerably.

Whenever I was defining a report with *Cornerstone*, I felt I was in a fog about what I had already defined and what remained to be done. After you define a columnar report through the menus, you can save it and later retrieve it, but you can't really find out what tasks you defined for the report. I really wanted a way I could define (or edit) the report definition first and then run it.

TWO USER MANUALS *Cornerstone's* manuals and tutorial are generally very good. The manuals have comprehensive indexes that help a lot, although the division of the user handbook into two separate manuals in the \$495 version (the second covering advanced topics) is a nuisance. Merging the manuals into one for the \$99.95 version will have fixed this problem. The advanced manual covers important (and often neglected) topics such as efficiency, saving disk space, and crash recovery.

On-line help is also available. Pressing the F1 key at any time brings up almost a screen's worth of contextual help information, but it's the slowest help retrieval I've ever seen. Part of its slowness results from the help's being personalized, since it incorporates actual information about your defined databases.

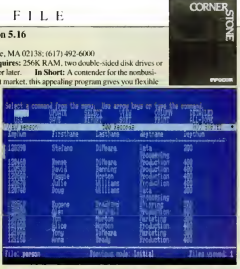
For \$495, I'd be skeptical about *Cornerstone*. But at one-fifth that price (sold through the same distribution channels Infocom uses for its games), the package deserves a chance to prove itself. With its



FACT FILE

Cornerstone, Version 5.16
Infocom Inc.,
55 Wheeler St.; Cambridge, MA 02138; (617) 492-6000
List Price: \$99.95 **Requires:** 256K RAM, two double-sided disk drives or hard disk drive, DOS 2.0 or later. **In Short:** A contender for the nonbusiness database management market, this appealing program gives you flexible file definitions and a convenient subfile provision—at one-fifth the original price. Not copy protected.

CIRCLE 144 ON READER SERVICE CARD



A typical *Cornerstone* menu is at the top of the screen; data is displayed below it. Notice the intelligent word wrap of long department names in the "define name" column.

flexible file-definition and convenient sub-file capabilities, *Cornerstone* is a hot contender for the nonbusiness database management market.—Charles Petzold

DATAFLEX

DataFlex, the full-featured applications development/relational database management system from Data Access Corp., may produce the most transportable applications code in this genre. The system runs on any operating system that supports the 8080, Z80, 8085, 8086, 8088, 80186, and 80286 single- and multioperator processors.

DataFlex contains a menu system, relational database, command language, forms-processing system, data processing procedures, an on-line multikey ISAM (Index Sequential Access Method), and an applications generator. Its designers make no bones about it—*DataFlex* is designed for the serious applications designer. It's powerful but not easy.

The purpose of *DataFlex* is to enable the applications designer to put together customized, menu-driven database (and other) software systems. *DataFlex* can be thought of as a language. There is no interactive mode. All interaction is performed by building source files that are compiled into *DataFlex* pseudocode. This pseudocode and *DataFlex* data files can then move easily from installation to installation and machine to machine.

Data Access also provides several powerful utilities (some written in the *DataFlex* language) that automate some of the code-writing tasks and make things reasonable for a *DataFlex* beginner.

IMAGE FORMATTING AUTODEF, which works with standalone data tables, and **FILEDEF**, which includes facilities for defining relationships among files, prompt the user for record and file specifications and then write the source code for file creation. These utilities also read text images of screens and create code for generating those screens automatically. This process, called image formatting, enables you to create screen images that any text processor can read. Images can contain



FACT FILE

DataFlex, Version 2.1b

Data Access Corp.
8525 SW 129 Terr., Miami, FL 33156; (305) 238-0012

List Price: \$995

Requires: 256K RAM, at least 600K of mass storage, DOS 2.0 or later.

In Short: A powerful applications development program that gives novice programmers several diverse and helpful utilities. Its consistent use of function keys is a real plus. Not copy protected.

CIRCLE #49 ON
READER SERVICE CARD

DataFlex's powerful QUERY program shown here generates source code for retrievals, using an easily accessible menu system.



data from multiple files, or a single file can have several images, with each displaying different data or performing different operations. Screen images can also be used as help screens to furnish customized, context-sensitive help.

READ generates source code for importing data files from other environments. QUERY generates source code for complex retrievals from the databases. This system is menu-driven so that you can "point" to your request (or sequences of requests) to get an ad hoc multifile report. Logical comparison and string searches are supported. Other utilities generate and link menus and expedite the development of code for all kinds of reporting.

When using menus that *DataFlex* produces, you can perform an action by entering a number that highlights it, then pressing the cursor keys and the Enter key.

HANDY FLEXKEYS An important feature of *DataFlex* is the fact that function keys always have the same task from one installation to another. For example, the Tab key is always used to find a record, the Return key is always used to move to the next field on a screen, and the F2 key is al-

ways used to move back to the previous field on a screen. These are called "FlexKeys." Other FlexKeys save and delete records or page back and forth through data records. A "superfind" FlexKey finds lower-level records in related tables. The FlexKey concept reduces training time and keypunch errors because the keyboard is the same from application to application.

Timing of sorts and retrieves without indexing really has little meaning with *DataFlex*. That's because *DataFlex* always maintains at least one index in a file and automatically maintains indexes on any field that is used for file-to-file links or for lookups within a table. In other words, indexes are not optional—they are at the heart of the *DataFlex* system. The nice thing about the way *DataFlex* handles these indexes is that everything is done in the background. (A feature is available to rebuild an index in case a table definition is changed or an index file is damaged because of machine or power failure.)

Many set features found in less-sophisticated systems are programmable with *DataFlex*—such as range testing—and require specific values, lookup to external

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■ RELATIONAL DATABASES

data tables, and so forth.

DataFlex has been successful with its source-code-only applications-generation format because the format protects the applications developer. A *Data Access* spokesperson explains: "If you give an end user (as opposed to the professional applications developer) a dot prompt and free access to all the data tables and program files, sooner or later he'll start messing things up. The end user will blame the software and the applications developer (never himself) for such damage. With *DataFlex*, the applications developer and his work are protected. The end user can only do what the applications developer permits him to do."

This is a professionally designed applications-development system for professionals. The promised new documentation may open the door for a new set of semipro users.—Richard Aarons

DAY ONE

Day One, Version 2.5, is a difficult program to pass judgment on. Like the IBM PC keyboard, this program scores exceptionally well in some areas but is equally lacking in others. And how you rate *Day One* will depend on which areas you consider most important.

The good news first: *Day One* can do anything you're likely to expect from a full-featured relational database program. It can manipulate data in up to nine files at once, its custom report generator can produce reports in any format, and it can generate data files in user-defined formats for use by other programs. And with maximums of 891 fields per record, 227,205 characters per record, and 65,536 records per data file, you're unlikely to run up against the program's limits.

Day One is completely menu-driven. This means you can create an application without having to program. It also means that developing an application with *Day One* differs from the means used by any database program with which you are likely to be familiar.

When creating a data-entry form or a report form, *Day One* asks for a name for the form, and it automatically adds that

name to the menu. If you don't like the logical structure of the menus, you can then use the menu-maintenance module to shuffle choices around and customize the program. A customization feature lets you develop a turnkey system that others can use with minimal training.

USEFUL SECURITY SYSTEM An important plus for many applications is *Day One's* security system. The first time you use *Day One*, the program asks for a name code and ID number. From then on, you have to enter these whenever you load the program. A security-maintenance module that lets you change the name and ID also lets you assign and delete other names as needed.

Day One's security system goes far beyond simple password protection. The program assigns each user a ten-digit security code that you can change as needed (the code can be the same for everyone or not). *Day One* compares this code to the security code you give to each menu choice. If the codes match, *Day One* will display the menu choice and number it appropriately. If the codes don't match, *Day One* will ignore the menu choice and the

user won't even know it exists. This means that the security-maintenance choice, for example, will not show up on the utility menu unless your security code allows it.

When comparing security codes, *Day One* looks for any one digit (0 through 9) to appear in the same position in both codes. This approach allows a great deal of flexibility in designing the security system and in controlling who gets access to what.

Very much on the minus side is that *Day One* has the look and feel of a CP/M program that's been transported to the PC. It's limited to monochrome text and takes little advantage of the PC's keyboard. The Cursor Up key is treated as an H and the Cursor Down key as a P. And although some commands are programmed on the PC's function keys, that's not mentioned in the manual.

OBSOLETE COMMANDS More troublesome are the obscure commands—such as Shift-[Backslash] for moving to the command line—and too many features that are simply clumsy. The custom report generator, for example, forces you to designate fields with a kind of code, so that F1206 means the sixth field in the second



FACT FILE

Day One, Version 2.5

Day One Inc.
900 W. Valley Rd., #402; Wayne, PA 19087; (800) GET-DAY1;
(215) 293-9777

List Price: \$695 **Requires:** 128K RAM, two disk drives, DOS 1.1 or later.
In Short: A user-friendly, full-featured database that has retained the look and feel of early (and clumsier) CP/M-based programs. Not copy protected.

CIRCLE 604 ON
READER SERVICE CARD

Day One's Menu File Maintenance module builds a file of data that yields a menu for entering data and other functions. The module itself is menu-driven.

MENU

Menu File Maintenance

```

1. Menu File Specification File
2. Menu File
3. Screen Description
4. Print Menu Number
5. Print Menu
6. Print Menu Security Code
7. Alternate Data Name
    
```

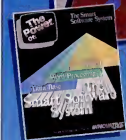
Enter instruction or field # and press ENTER



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CIRCLE 363 ON READER SERVICE CARD

screen of the first file. And the program offers no help in figuring out which field is which.

One other important drawback is the *Day One* manual. Although the tutorial takes you through most of the program's features, in general it merely tells you which keys to type without explaining what you're doing or why. The reference section gives the mechanics of using various features but usually fails to explain why you might use each one. Even after going through the tutorial and the reference section, I found that actually learning to use the program took far too much trial and error than should have been necessary.

Almost making up for the manual is *Day One's* support policy. This includes an 800 toll-free number that shows up on the *Day One* sign-on screen with an invitation to call. Even better is the news that Day One Inc. is currently rewriting the manual. According to the company, the new version will eliminate references to the CP/M and TRS-DOS versions, mention the commands that have been programmed into the function keys, and hopefully offer much more information.


What this adds up to is that you may consider *Day One's* shortcomings to be irrelevant, or you may feel they overshadow the good points. But either way, be assured that the program is worth a look.

—M. David Stone

DB-FABS

DB-FABS, Version 1.16B, is designed for the BASIC programmer who shudders at the idea of creating specialized database programs. Although you can use *DB-FABS* as a standalone database management program, its real strength is as a "run-time" module accessed through a high-level language. The *DB-FABS* program disk includes an interface for both compiled and interpreted Microsoft and IBM BASIC. Computer Control Systems can also supply (at no extra cost) additional disks with links to Microsoft Pascal, Microsoft FORTRAN, and Lattice C.

The program's database-management features chart lists only the facilities of the *DB-FABS* standalone module; it doesn't

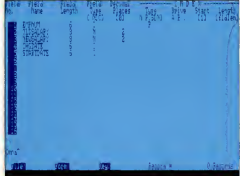


FACT FILE

DB-FABS, Version 1.16B
Computer Control Systems Inc.
Route 3, Box 168; Lake City, FL 32055; (904) 752-0912 Phone TK
List Price: \$295 Requires: 192K RAM (256K with run-time), two double-sided disk drives or hard disk, DOS 2.0 or later. In Short: Valuable high-level assistance for BASIC programmers who need to write their own database programs. Not copy protected.

CIRCLE 880 ON READER SERVICE CARD

DB-FABS



Defining a database file in DB-FABS requires filling in information describing the fields. The "Cmdr?" near the bottom of the screen is the command line prompt.

list what programming you can do through the run-time module. As you'll note from the chart, the emphasis that *DB-FABS* puts on the run-time module has made the standalone weak in features.

The standalone database manager uses a command line for most functions. It has commands for sorting and indexing, plus creating and altering file definitions, report formats, and data input screens. Although you can get a simple column report with just a List command followed by field names, this command prints only the data. More-sophisticated Create Report and Alter Report commands let you define a report through a combination of screen painting, answering prompts, and some very rudimentary procedural language programming. Although the Create Report facility seems well thought out, I found it confusing and clumsy to use, particularly when I had to go back to the Alter Report menu to fix things up.

RELATIONAL CAPABILITIES The relational capabilities of *DB-FABS* have strict requirements. The Link command sets up a relationship between your files, but these relationships must be in a single

continuous chain. That is, a field in the active file can be linked to a field in a second file, then a different field in the second file can be linked to a field in a third file, and so on. These linked fields must have the same names. (Although this system worked fine for the PC Magazine Labs testing script, it's easy to conceive of cases where it would be inadequate; for instance, where an active file would need look-up values from three other files.)

Moreover, although the manual doesn't mention it, the field linked between the active and the second file must be a primary index in the first file and a secondary index in the second file. The field linked between the second and the third file must be primary in the second and secondary in the third. If the indexes are not set this way, the List command will pretend it's printing data but will actually print spaces.

Pressing Ctrl-Q at the command line brings up a help menu with over 50 options. The help screens generally describe the syntax of the various commands in the form of an on-line manual. Computer Control Systems is in the process of revising the printed manual. This revision is badly needed. Right now, the manual con-

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■ RELATIONAL DATABASES

tains just a chapter of general information, two tutorials (one for the standalone version and one for the run-time version), and a reference section with all the commands in alphabetical order. There's no index.

RUN-TIME MODULE As I mentioned earlier, the real value of this package is as a run-time module accessible through high-level languages. The run-time module is a remain-resident program that stores its entry address in a tiny file on the floppy disk. Your BASIC program then reads this file and calls resident subroutines. The *DB-FABS* run-time module is one of the few resident programs I've seen that handles residency politely. It will attempt to load *COMMAND.COM* on top of itself, so you can remove it from residency just by entering *Exit* on the DOS command level. All resident programs should work in just this way.

You can duplicate in a BASIC program virtually all the facilities of the standalone module by making calls to the run-time module. The run-time module also includes commands that could not be implemented in the standalone, such as *PUT* and *GET* statements for accessing individual records from a *DB-FABS* file. You can convert between BASIC and *DB-FABS* file formats, sort files, set up relational links, and execute predefined input screens and reports just by using the *BASIC CALL* statement.

Although I cannot recommend it as just a database management program, *DB-FABS* can be very valuable to BASIC programmers in need of high-level assistance for writing their own database programs.—Charles Petzold

ENRICH

Enrich, Version 1.1, from Migent Software Inc., is one of the new breed of database programs that do their best to offer, in a "friendly" form, the advanced functionality needed by corporations. Aimed squarely at the nonprogrammer, its key design feature is ease of use. Yet this fully menu-driven program offers enough functions and flexibility to handle sophisticated data management tasks. And short of



FACT FILE

Enrich, Version 1.1

Migent Software Inc.

P.O. Box 6062; Incline Village, NC 89450; (702) 832-3700

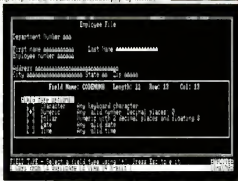
List Price: \$395

Requires: 256K RAM, two floppy disk drives, DOS 2.0 or later. In Short: A fully functional relational database that is easily accessible to the nonprogramming corporate user. *Enrich* includes pop-up menus

and an intelligent use of color to make the program more accessible. Not copy protected.

CIRCLE 682 ON READER SERVICE CARD

*Enrich uses pop-up menus to assign characteristics to fields in a data entry form. This menu for field type options demonstrates *Enrich's* typically large range of choices.*



needing to develop an application complete with customized menus for others to use, there are few situations where *Enrich* won't do the job.

SUPERIOR DOCUMENTATION *Enrich's* approach to ease of use begins with some of the best manuals I have seen. Significantly, the 16-lesson tutorial is thicker than the reference and applications manuals combined. Newcomers to database management will appreciate the clear, step-by-step instructions. More-sophisticated users will appreciate the design layout that lets them skip over explanations they don't need.

The tutorial is well indexed, but that seems superfluous. Once you've finished it, you should know the program well enough to rely on the reference guide.

The applications manual is a collection of data-entry and report forms. Migent has identified six common applications areas—real estate, job estimates and billing, expenses, personnel, sales, and shipping—and has provided more than 50 forms with the program. This manual is a thoughtful addition that lets you see the forms without having to print them out.

The program itself is filled with minor conveniences: the bottom line of the screen always shows the current function-key commands, the context-sensitive help screens are available at the touch of the F10 key, and intelligent use of color draws your attention to the most important information on the screen. But *Enrich's* real strength is that it lets you concentrate on what you want to do rather than how to explain the task to the computer.

To edit a form in *Enrich*, you type text and data fields on the screen. For report forms, you assign data to the fields by first choosing the "Field" function key, then following menus to designate the formula or the file and field to use. For data-entry forms, you similarly choose the Field function key. *ENRICH* responds with a list of customization options such as type, origin, appearance, pattern, and file (to enter or change data in another form).

Customization choices for data fields also include conditional commands that let you specify different actions for any number of situations (conditions). Access to conditional commands lets you do things like underline the date field in an unpaid invoice form after 30 days and set it to

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CIRCLE 177 ON READER SERVICE CARD

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■ RELATIONAL DATABASES

blink after 60 days. More noteworthy is the fact that, when defining conditional commands, *Enrich* guides you through each step. And when you're using the program to find information, *Enrich* follows the same strategy for defining a search.

Also in the category of letting you concentrate on data is the way *Enrich* handles changes in forms. Even if you already have data entered for a given form, you can go back to the form, add fields, delete

■ Newcomers to database management will appreciate *Enrich's* clear, step-by-step instructions.

them, move them around, and change their characteristics. When you save your changed form, *Enrich* revises the data files as needed.

More-advanced features of the program include custom menus and a security system to limit access to viewing or maintaining the files.

FAULTY CUSTOM REPORT GENERATOR

In testing *Enrich*, I ran across two important shortcomings; both are in the custom report generator. First, *Enrich* will give only subtotals in its footers. This means that if you want subtotals at the break points in a report, you have to ask for a new page at each break point.

More important, you cannot sort a report by fields in a linked file; you must use fields in the main file. Given the ease with which you can alter the main file to add a new field, this isn't a serious problem. But I'd feel more comfortable if the program would refuse to accept my sort instruction instead of appearing to accept it and then ignoring it. (Migent is aware of this problem and says it will correct it in the next update.)

I'm not sure whether I'm more impressed by *Enrich's* ease of use or the extent to which its menus anticipate the more complicated things I may want to do. But either way, the program is worth looking

at—unless you prefer spending your time debugging procedures instead of working with your data.—M. David Stone

FILES & FOLDERS

Starcom Computer Corp. describes *Files & Folders* as an interactive filing and reporting system. This menu-driven system combines the ease of operation of single-table, simple file systems with the benefits of multifile relational systems. However, *Files & Folders* does have some very real limitations in the simultaneous use of multiple tables.

The *Files & Folders* package includes two identical copy-keyed system disks, a standalone tutorial disk, and a standalone demo disk. This system is designed to run on a two-floppy-disk PC and seems to pack more features than most systems designed to run in a non-hard-disk environment.


On the good news side, *Files & Folders* does well within its design limitations. The program uses prompted menus and function keys for file creation, data lookup and

modification, and reporting. When *Files & Folders* is called up from DOS, the user's screen becomes a giant file folder complete with file label tab. I'm not sure whether the file folder screen helps, but it doesn't do any damage.

DESIGNING A FILE Command prompts and context-sensitive help appear on the bottom three lines of the screen. Additional pages of help are available at all times with the press of a function key. All *Files & Folders* commands are invoked by pressing function keys.


This prompting system enables the user to design a file (flat with rows and tables) using painting techniques. Prompts also ask the user to assign indexes and pointers. As soon as the table is designed, the "file-folder display" becomes a data I/O display with full-screen editing, field masking, and more context-sensitive help.

A strong element in the design concept for *Files & Folders* is meant to help non-technical types understand and use relatively sophisticated data-management techniques. To this end the product creates an analogy with a filing cabinet. For example, *Files & Folders* considers itself to be

**FACT FILE**

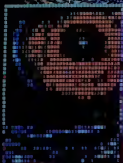
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22121 17th Ave. SE: Bothell, WA 98021; (206) 486-6644
List Price: \$295 **Requires:** 196K RAM, two disk drives, DOS 2.0 or later.
In Short: A rather limited database that uses an "electronic file cabinet" analogy to make its workings more accessible to novice users. Although it has several quite powerful features, its unusual format should be examined closely by potential users. Copy protected.

CIRCLE 67 ON READER SERVICE CARD



As shown here, *Files & Folders* works on a "folder" analogy and gives the novice user a complete selection of screen prompts and explanations.

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■ RELATIONAL DATABASES

an "electronic file cabinet" and defines itself as being similar to "a storage unit that stores data much like a regular file cabinet with distinct advantages. Information can be accessed and changed quickly, organized more efficiently, and stored more securely."

Following the analogy, a "folder" is a logical, organized grouping of "boxes" that store several "cards" (records) together. For example, all customers would be in one folder while inventory would be in another. A card is one of the group of like data made up of one or more boxes within a folder. For instance, one customer and all the data fields associated with the customer would constitute a card. Finally, box is another name for field: one logical item of data in a folder, such as an employee name, a telephone number, or a pay rate.

This concept of folders, cards, and boxes is used in the tutorial and throughout the documentation. The terms are also used during screen prompting. For a newcomer to computers and databases, the analogy may be helpful. To those familiar with fields, records, files, and relations, the terms are confusing and must be translated on the fly.

USEFUL FEATURES Despite all that, *Files & Folders* has some very powerful and very useful data-management and reporting capabilities. Data import from SDF files is quick. One nice feature enables you to monitor the import of records. This provides a good check for data integrity as patterns flash on the screen. A break in the pattern might mean a glitch in the data.

Excellent internal facilities are available for file duplication, backup, and copy. You create reports by following screen prompts for header and footer information, any record links necessary, detail formats, and groupings. The end product can be directed to screen, printer, or disk and is very professional in look and function.

I suspect the *Files & Folder* "folder-card-box" orientation will divide potential users into two classes—those who love it and those who hate it—with no middle ground. If you are in the market for a relatively low-cost, high-feature system that



FACT FILE

Formula IV, Version 1.16

Dynamic Microprocessor Associates Inc.

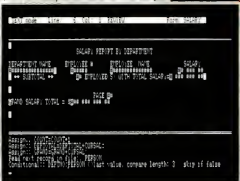
545 Fifth Ave., New York, NY 10017; (212) 687-7115

List Price: \$695 Requires: 256K RAM, two disk drives, DOS 2.0 or later.

In Short: Powerful, fast, friendly—this program stands out from the others because of its multuser kernel; it combines the power of a multuser database system while retaining the simplicity of a user-friendly human interface. Not copy protected.

CIRCLE 84 ON READER SERVICE CARD

This Formula IV Report Definition screen illustrates the clarity with which the program organizes its data, including various mathematical functions.



can be used right out of the box after an hour or so with the on-line tutorial, this package deserves a look.

Files & Folders could provide just about all the database power needed at home or in a small business. It will be especially valuable to those who don't understand computers and databases and don't want to.—Richard Aarons

FORMULA IV

Formula IV is one of those rare products that give the user more than what is commonly expected in a database product. Although it is quite powerful, its user-friendliness allows anyone to harness that power. The program's designers have included context-sensitive help screens that are always available at the touch of a key. All these features combine to make a product that is a pleasure to use.

Creating a database application with this product is often as simple as running three programs that guide you through each needed subprocess. You use the first program, *Filedef*, to create the actual data

file layout and specifications. The second, *Fileproc*, is then used to enter data into these files, and the third, *Query*, allows you to print or display reports by typing simple English-like commands.

Happily, each program prompts you for these commands and lets you know very quickly what is right and what is wrong. I found that I was up and running my applications noticeably faster with *Formula IV* than with other database programs I have used. After working with the program for a few days, I found myself growing less and less reliant on the help function—a sure sign that the program operates logically and the way you would expect it to. And unlike with so many other programs, I very rarely had to resort to thumbing through the reference manual.

A MULTIUSER KERNEL AND MORE

One of the extra things that makes *Formula IV* stand out from the crowd is its multuser kernel. *Formula IV* is the only database product I know of that allows you to add multiple users (up to six) without any extra network hardware. *Formula IV* uses the PC's standard asynchronous communication ports to attach either other PCs or

"dumb" terminals (such as a DEC VT-100) to the master PC. The users of each slave terminal appear to have their own dedicated PC running an existing database application, a form design session, or even some DOS programs. System integrators who want to build a multiuser database only have to design the application as though it were running on a single user system, and *Formula IV*'s kernel takes care of the rest.

File extension is handled in a dynamic fashion; when adding data to a file, the program keeps track of all pointers and housekeeping information in order to prevent overlapping updates. Also included are automatic file and record locking, password protection, and the ability to share recent program modules between users.

SMOOTH MENU HANDLING Another nice feature of *Formula IV* is the manner in which it handles menus. As the database designer, you use a system menu function that is similar to that employed by other products, but you may also create multilevel menu systems (primary menus, submenus, and so forth) that will eventually be employed by the user of the database. This creates a consistent operational interface at all levels of the system. A novice user will feel comfortable with even the most complex data definitions.

Formula IV is an excellent product for users who need to get their database applications running quickly. It is an even better product for system integrators and software houses that need the power of a multiuser database system, while retaining the simplicity of a user-friendly human interface. —Bill Harts

INTEGRATED 7

A relational database module and a familiar menu structure are attractive come-ons for Mosaic Software's \$695 *Integrated 7*. In actual use, however, some of the database operations are terribly slow, even with just a few hundred records loaded into your file.

The manufacturer stresses *Integrated 7*'s ease of use and to that end provides a



FACT FILE

Integrated 7, Version 1.2

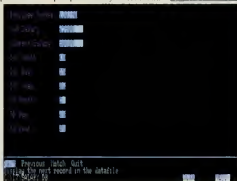
Mosaic Software

1972 Massachusetts Ave., Cambridge, MA 02140; (617) 491-2434

List Price: \$695 **Requires:** 320K RAM, one 360K double-sided disk drive, DOS 2.0 or later. **In Short:** *Integrated 7*'s database has an easy interface and good relational capabilities but is a poor performer if you need to manage a significant amount of data. Not copy protected.

CIRCLE #75 ON READER SERVICE CARD

Input forms for *Integrated 7* are created by entering information into the Make File screen.



helpful pair of audio tapes to bring novice users up to speed with the program. For those really new to the game, the tapes also explain hardware fundamentals and give a brief historical tour of computing.

The menu structure is consistent throughout all modules (which include word processing and a spreadsheet along with the database reviewed here) and features a 1-2-3-like menu for all operations. For example, to enter the database module you simply choose Database from a horizontal menu.

CREATING A DATABASE FILE The first step in creating a database file is to design the input form. This is done by filling in a form that *Integrated 7* displays on-screen. You enter field names, lengths, types, and whether or not you want indexing or security. Once this is done, a database input form is automatically generated by the program, and menu commands let you add, edit, view, find, or delete records in the database file.

An interesting feature of *Integrated 7* is a command called "Template." Templates are used to create a subset of the original record, which is handy if you want

to view, for example, four fields of a ten-field record. Templates are also useful for constructing major subsets of the original file.

The report feature of the database is easy to use but not very flexible. A report consists of a two-line header, column headings, and columns of information from the database file. Although you have control over the positioning of the header, field headings, and columns, all placements must be worked out manually. For instance, you must tell the program how far from the left margin to place column headings and columns.

NO DATABASE SUBTOTALING Other shortcomings of *Integrated 7*'s report generator may be due to the integrated design of the product. There are no provisions for breakpoints, and neither subtotals nor totals can be calculated directly within the database module. However, these can be included in a report if you first transfer the database file to the spreadsheet portion of the program and report data from there.

You can use *Integrated 7* to print labels, but extra spaces in a field cannot be eliminated. Also, it is not possible to print out

■ RELATIONAL DATABASES

single records, which you might want for invoices, other than by using the PC's print-screen feature.

The program includes a feature called Datamail that lets you merge database information with its word processing documents to create form letters. In this case, any extra field spaces are removed from the document before printing.

IMPORTING QUIRKS If you want to import a file to the database, you may encounter problems. The database module cannot import directly but can receive data from the spreadsheet module. The spreadsheet can import DIF files and also receive data from the word processing module. The word processor can import ASCII files. The only drawback is the 80-column limit of the word processor. Records that are longer are imported as two lines, or records. When I tested the product, 500 eight-field ASCII records were brought into the word processor and about 20 of them were longer than 80 characters. I transferred the file to the spreadsheet and reconstructed it there.

There was also a problem in the spreadsheet with the ZIP codes. Although imported as a character field, the spreadsheet treated them as numeric and dropped leading zeroes on more than 50 records. Fortunately, *Integrated 7* lets you construct macros, which I used to change the ZIP code field from a number to a character field.

Integrated 7 macros are very easy to create. Just choose Macros from the menu and enter the relevant keystrokes into the program. One difficulty was caused by incorrect documentation. Nonprinting keyboard characters must be enclosed in curly brackets ({}); unfortunately, the manual says to use braces {}, but *Integrated 7*'s on-line context-sensitive help feature solved the problem.

Once the spreadsheet was transferred to the database, it became obvious that *Integrated 7* was not designed to efficiently handle files, even if they contain as few as 500 records. Sorting the test file took more than 20 minutes, indexing it on two fields took more than 1½ hours, and using the relational properties of the database to join three files together (two at a time) to prepare a report took more than 6 hours.

To malign an integrated package solely on the basis of one module is certainly unfair. But prospective purchasers should be aware that *Integrated 7*'s database module is not the strength of this package. However, it is fair to say that if you plan on building files more than 50 records long and if the database is the module of an integrated package you are most interested in using, then *Integrated 7* is not the program for you. —Joe Desposito

KALEIDOSCOPE

Kaleidoscope from DBI Software Products is an anomaly: it has its roots in the CP/M world yet is touted as the most revolutionary concept in fourth-generation software. For a suggested retail price of \$495, you get a file manager (called the Editor), the DATA BASIC language, a systems designer package, mail-merge software, and a utility to import and export files to a spreadsheet. The combination of the Editor and DATA BASIC transforms the product from a simple file manager to a more powerful database manager.

Getting the program up and running on an XT is a chore because of the confusing directions. When you open the package you find a hardbound book called the Advance System Pac that has a 1981 copy-right date. There are five soft-covered tutorial manuals that cover the areas mentioned above. The confusion starts with a 1-page brief with the commanding headline "Read Me First." Instructions are given for setting up the program on a hard disk; they do not work. Then there are 5 typed pages of changes in documentation. Finally, you find a pamphlet on preparing a working disk for the IBM PC. Eventually, in my case, a customer service representative provided the key to setting up the program on a hard disk: you must create an ANSI configuration in the root directory.

With *Kaleidoscope* properly installed, typing KL brings up the main menu. The menu system is irritating because it responds so slowly to keyboard input. For example, if you choose the next menu level from the main menu, it takes 8 seconds (a long time in computer terms) to redraw a new screen, with the cursor flying all around during the process.



FACT FILE

Kaleidoscope, Version 7.2

DBI Software Products

206 W. Michigan, Mount Pleasant, MI 48850; (800) 221-3791; (517) 772-5055

List Price: \$495 **Requires:** 64K RAM, two disk drives, DOS or later.

In Short: Based on the clever concept of designing sophisticated database programs through simple

BASIC-like statements, this program—although touted as a revolutionary fourth-generation product—is actually quite limited and hard to use. Not copy protected.

CIRCLE 425 ON READER SERVICE CARD

The structure of a file as defined with *Kaleidoscope*. Note the initial key field, which must be selected when defining the file.

Enter name of primary key field - EMPLOYEE #
Structure definition complete

FILE - TEST
RECORDS - 400

KEY FIELD - EMPLOYEE # # OF RECORDS - 0

```
1. FILE NAME (F) : _____
2. KEY FIELD (K) : EMPLOYEE #
3. RECORDS (R) : 400
4. INDEXED (I) : YES
5. INDEXED (I) : YES
6. INDEXED (I) : YES
7. INDEXED (I) : YES
8. INDEXED (I) : YES
9. INDEXED (I) : YES
10. INDEXED (I) : YES
```



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CIRCLE 209 ON READER SERVICE CARD

MCDONNELL DOUGLAS

■ RELATIONAL DATABASES

LIMITED FILE SYSTEM Creating files is done through the Editor. When you choose this option, the first item you are presented with is: "Block size = 24. Do you wish to change value?" The documentation doesn't give you a clear idea of what this means, but you soon come to realize that if you enter more records than the block size can handle, the system hangs.

Whenever you set up a file, you must select a primary key field, one that contains a unique entry for each record. This field is used later on when you want to link files together. You can sort the file on the primary key by just typing the Sort command. However, if you want to sort on another field, you must first change the key field with an Alt-key command. Then, if you want to search the file, you must change the key field back to the primary one with the Set command or create a subset file.

The Editor's search feature has a major limitation: you cannot directly search for a record if you use more than one condition. For example, suppose you wanted to search for an employee named Williams who works in Poughkeepsie. First you must search for all people named Williams and create a subset file of these people. Then you search the subset file for a city named Poughkeepsie. Neither sorting nor searching is done with great speed, since *Kaleidoscope* is a compiled BASIC program.

Simple reports can be generated with the Editor, and mailing labels are easy to do. For form letters, a utility called Data Merge can be linked to any files created with the Editor.

LANGUAGE PROBLEMS To perform any relational functions with database files, you need the DATA BASIC language. DATA BASIC is an interesting facility. You write a program with simple commands such as SET;I;Dept;D;, and the commands are translated into equivalent BASIC commands. Once you set up your files with the Editor, the language can manipulate them any way you want. DATA BASIC even includes a BAS command that lets you insert actual BASIC statements into a program.

Unfortunately, DATA BASIC is plagued by some of the same problems that

flaw the rest of the program. That is, the documentation is sparse and outdated in some areas, and the program will hang if you make a mistake such as entering an incorrect filename in a Set command.

INCONSISTENT PRESENTATION

Another problem with *Kaleidoscope* is that it is not consistent in its presentation. It's as if new features have been added over the years without regard to how they relate to the whole program. For example, the program gives you three ways to sort: (1) from within the Editor by issuing a Sort command, (2) by choosing Fast Sort from a menu (both can sort on only one field, and both sort at about the same speed), and (3) by using multilevel sorts. But to access the latter function, you must create a custom menu.

The idea of designing sophisticated database programs through simple BASIC-like statements is a clever one. However, I found *Kaleidoscope* difficult to work with. A developer of turnkey database systems who is committed to BASIC programming might consider taking a chance with this product, but I wouldn't recommend it to anyone else.—Joe Desposito

KEEPT

KeepT is the core program of Martin Marietta Data Systems' unusually complete ITSoftware Series. The series is fully integrated, yet each component is a complete standalone unit. While *KeepT* does not have an attractive user interface, the program is packed with utilities and features that leave other databases far behind.

KeepT's modularly designed BASIC program file routines are almost too plentiful. There are over 15 routines apiece for functions such as file definition and house-keeping and data interface, and reporting routines. Initially, wandering around the routines is overwhelming, and *KeepT*'s confusing and unhelpful file extensions do little to clarify the subject; but if you give yourself a week to learn *KeepT*, you will find the time well spent.

The main menu lists a staggering 29 options; each is initiated by typing in the first two letters of the command. Users who

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■ RELATIONAL DATABASES

prefer a sparser main menu will have difficulty adjusting to *KeepIT*'s zeal for presenting all the options fit to print on a single screen. This cornucopia of menu choices is its greatest weakness.

DATA ENTRY CHOICES Creating a new *KeepIT* database is a straightforward operation. As you enter information, you can specify a fine degree of range restrictions, required inputs, conditional defaults, math formulas, and transaction numbers. Compute/Fill data routines, which take the contents of one field entry to answer another (for example, using the ZIP code to automatically fill in the city field), can help cut keystrokes. With minimal planning, your data entry screens can be incredibly stylized.

Those used to more traditional field specifications may find the data-input scheme a bit contorted. For example, since there is no numeric data field restriction, I opted to specify my employee number as an integer (the only other possible alternative would have been to enter the employee number as an alphanumeric and then use the range restriction routines to restrict the input to nonalphabetic characters). This alternative seemed too convoluted to be plausible. But when I used the integer field, my employee ID number caused a BASIC overflow error and crashed the program. Worse still, *KeepIT* displays the traditional BASIC error messages and the manual includes only a partial listing of explanations. You'll need to secure a BASIC manual if you intend to use *KeepIT*.

On a brighter note, you'd be hard-pressed to find a data format that *KeepIT* can't handle. In addition to interfacing with other ITSoftware members (such as *WritIT*, *CalcIT*, *ShowIT*, and *LinkIT*) and with RAMIS II mainframe database files, the program can interface with numerous word processors, .DIF, SYLK, .WKS, and ASCII file structures, variable-length fields, and fixed-length records. I counted over 30 different interfaces and tested four of them, all of which worked flawlessly.

Report facilities are equally comprehensive. The report generator offers a fill-in-the-blank report form allowing you to quickly title and index the report, select

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■ RELATIONAL DATABASES

criteria, lay out the page and printer characteristics, perform linkages (between two *KeepIT* files only), and perform math and statistical operations on specified fields. Again, my only complaint is the unhelpful error messages when a report-generation feature fails.

AUTOMATICALLY GENERATED REPORTS Reports can be stored as catalogs and automatically generated. A macro-like feature called a command file also lets you run a series of *KeepIT* program routines automatically.


According to Martin Marietta, *KeepIT* is now being packaged with *AskIT* (formerly available as a \$100 enhancement). *AskIT* provides a front-end window for *KeepIT* and allows you to prepare a cataloged record of *KeepIT* files. *AskIT* also provides quick report generation and calculations on fields. It accepts mouse or keyboard input and is a well-executed attempt at beautifying the less-than-glamorous *KeepIT* user interface.

KeepIT is a large program, so enormous that it borders on unwieldy, and its appearance is relatively rustic. But the medium- to large-size company with ever changing import and export requirements and a mandate to remain flexible may find *KeepIT*'s multiroutined structure a reasonable solution. This log cabin of databases is not very fancy, but it is structurally strong.—Robin Raskin

MAG/BASE 2

MAG/base 2, Version 4.0, makes the grade as a Category 2 database on the merits of its relational report writer, a compiler-based facility capable of accessing up to five files to create reports and physically join files. Alas, a report writer alone—even a good one—does not a database make, and, although its database inquiry and maintenance functions are easy to use, they don't live up to the performance standard set by its report writer.


MAG/base 2 holds the PC at arm's length, sacrificing high-performance screen drivers and the use of the PC's function keys in favor of compatibility with a host of other computers and terminals. If




FACT FILE

KeepIT, Version 2.40
Martin Marietta Data Systems
P.O. Box 2392, Princeton, NJ 08540; (800) 222-0592, (609) 799-7500;
List Price: \$459 (bundled with AskIT) Requires: 128K RAM, two disk drives, DOS 1.1 or later. In Short: This ungainly but functional database is especially useful for companies with heavy data import/export requirements. Not copy protected.

Circle 66 on Reader Service Card



Defining the *KeepIT* data fields can be an exercise in precision. You must define not only the field length, but the page, row, and column numbers as well.



your shop mixes IBM with CP/M, you'll benefit from the fact that *MAG/base 2* not only runs in both environments but also does so without altering its user interface. In place of function keys, you'll find menus—a lot of them—making file definition, data entry, and database inquiry easy to perform. While that's a boon to novices, the lack of a direct command mode and other shortcuts to alleviate the program's strict sequential structure will probably frustrate more-experienced users.

PROGRAM LIMITATIONS Experienced or not, you'll find that getting comfortable with some of the program's other restrictions is tough. For example, *MAG/base 2* maintains internal records of files and the disk drives where they are stored, which make it easy for the program to present those files in its menus. But you sacrifice the freedom of using DOS to delete files or move them between disks.

The program also automatically maintains serial numbers to identify each data file. If you delete a file, *MAG/base 2* renumbers remaining files to reestablish an unbroken sequence of numbers. But the report writer also uses those serial numbers

to identify files, and *MAG/base 2* unfortunately doesn't update your reports when it changes serial numbers. So, since the report writer is a compiler, plan on editing and recompiling every report containing a revised file number. That will be more than a little painful if you have a large number of reports.

Indexes play a pivotal role in *MAG/base 2*. Every file must be indexed because that is both the sole method of reordering a file (sorting is unavailable) and locating records within it (sequential searches on nonindexed fields are not supported). Frankly, I miss both facilities. Sequential searches and sorts in other products tend to be slow, but they offer irreplaceable flexibility. In *MAG/base 2* those once-in-a-while searches that don't justify maintaining an index suddenly require one. And, sans sorting, you lose the option to eliminate the overhead of otherwise unnecessary indexes.

Worse than all of that, however, are the performance implications of *MAG/base 2*'s limitations. The program will support up to 99 indexes, which might lead you to index everything in sight to give yourself good data sorting and access. However,

MAG/base 2 will update each index during data entry, and the resulting time penalty is awesome, which makes the number of possible indexes more of a theoretical possibility than a practical database strategy.

As long as the fields are indexed, you can easily search for records based on criteria from more than one field, if, that is, you have all the criteria at hand. If you don't, restrictions on the use of wildcards may thwart your search operations. If you leave the last fields blank when specifying a search criterion, *MAG/base 2* will treat the blank fields like wildcards. However, if the leading fields are left blank, the ensuing search will fail. The remedy? Create (yet) another index to reorder the fields.

MAG/base 2 earns points for offering you the option of designating your keys as either unique (which screens out unintentionally duplicated items such as social security numbers) or duplicate. But the program shows its rigidity once again by requiring you to define a unique key before you define any others.

MANUAL'S SHORTCOMINGS Since *MAG/base 2* provides no on-line help, the manual is your exclusive source of information. But it lacks both an index and a comprehensive table of contents. Tables of contents sometimes exist for individual sections, but they are actually just subject listings without the corresponding page numbers. Essential facts on a subject are sometimes spread over disparate sections, definitions for the program's coded error messages do not exist, and at least some of the included material is actually irrelevant to *MAG/base 2*.

That may explain why *MAG/base 2* does not directly support importation of ASCII files, even though the documentation claims otherwise. A separate utility handles that job nicely, provided you import fixed-length records and are willing to part with \$50 for the privilege of using the utility.

Despite documentation-related obstacles, persistence pays off when it comes to *MAG/base 2*'s report writer. This facility can operate on up to five files and makes short work of things that can require extensive coding in other programs—that's good performance for the product's \$195 asking price.

NO MANY-TO-MANY RELATIONSHIPS The five reported files can relate only to one another on a one-to-one basis. While that limit allows you to handle one-to-many relationships (such as the department-to-employee relationship found in *PC Magazine's* Category 2 report exercise), more-complex many-to-many relationships exceed *MAG/base 2*'s grasp.

More-experienced users will relish the fact that this part of the program is not menu-driven. You must prepare a text file containing a coded description of the report you wish to generate and then compile and run it. It's a simple form of programming that can include statements for conditional selection of records, storing data in variables, and performing calculations. But it is a special-purpose language, only suited to producing reports, and is limited by its lack of traditional controls (no If, While, Goto, or Case constructs exist).

However simple *MAG/base 2*'s report language is relative to other languages, it is tricky, so don't expect inexperienced operators to format reports. Both files and fields are referred to through numeric aliases, and commands take on an abbreviated two-letter form. *MAG/base 2* pro-

vides an integral editor to service the report writer, but I found DOS's meager EDLIN superior enough to warrant using that instead. Picture formats are available to control the presentation of numeric fields, and, unlike other areas of the program where sorting is unavailable, the report writer allows you to designate sort sequences for each file without having previously created an Index key.

When you compile the program, *MAG/base 2* will generate a message telling you how many errors it detected but not where they occurred. Even if you compile a report with no errors (which took me several tries to do), you may still encounter errors at run time. If you do, the report will terminate as soon as it encounters a problem and print the offending line. Since errors may yet lurk on subsequent lines, expect to edit, recompile, and run a report several times before getting it right.

MAG/base 2 packs real punch in its report writer but lacks follow-through in the remainder of the program. File creation and data entry are straightforward, but the database inquiry and file maintenance operations lack flexibility. If you can live comfortably within these limits, the menu-



FACT FILE

MAG/base 2, Version 4.0

Rocky Mountain Software Systems

P.O. Box 3282; Walnut Creek, CA 94598; (800) 832-2244; (800) 732-2311 (in Calif.)

List Price: \$195 **Requires:** 128K RAM, two disk drives, DOS 1.1 or later.

In Short: Besides the CP/M-to-DOS transition pains, *MAG/base 2*'s menu-

driven structure and built-in limitations might try your patience. If they don't, its powerful report generator's lack of good feedback and interaction just might. Not copy protected.

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While *MAG/base 2* provides you with a line editor for its report writer function, it is so awkward that you may prefer DOS's EDLIN instead.



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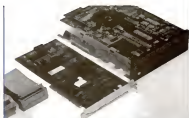
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■ RELATIONAL DATABASES



FACT FILE

Manager, Version 5.0, Release 2

Manager Software Inc.
1155 Los Altos Ave.; Los Altos, CA 94022; (800) 227-6623 (in Calif.); (800) 227-6621

List Price: \$119; \$39 additional for phone support
two disk drives, DOS 2.1 or later

Requires: 192K RAM, In Short: This well-designed relational database has several shortcomings but makes up for them by an innovative and excellent user interface. Not copy protected.

CIRCLE 003 ON READER SERVICE CARD

Manager includes a sophisticated form generator, but even this default screen is highly readable. Note that blank spaces are not allowed in field labels.

PERSON	NAME	DOB	ADDRESS	CITY	STATE	ZIP	TELEPHONE
1	JOHN DOE	01/01/50	123 Main St	Anytown	CA	90210	555-1234

driven structure provides good support for inexperienced users, but the poor organization of the manual coupled with the initial complexity of the powerful report writer suggest novices will need more help than they'll find here.—Dick Ridington

MANAGER

If you're a non-quickie eater who believes that real relational database programs are built around a procedural language, you should definitely take a look at *Manager*, Version 5.0, Release 2. Priced at just \$119 without telephone support or an additional \$39 with support, *Manager* might even qualify as a bargain.

Although designed primarily as a command-based program, *Manager* has a split personality, offering a menu mode as well. The menu mode not only lets a newcomer use the program immediately, but it is ingeniously designed to teach users the *Manager* commands and syntax. What's more, it's an integral part of *Manager*, not an afterthought that's been whipped up as a sop to beginners.

TWO MANAGERS IN ONE You can think of *Manager* as two programs: The underlying, command-based module wants to see typed commands. The menu module, when used, sits on top of the database program. Its function is to force you to construct acceptable commands by stepping you through the command-writing process.

To create the data file TEST in command mode, for example, you type "CRE TEST;". To create the same file from menu mode, you choose "2 - Create a Data file . . . CRE" from the main menu, pick "Name of DATA file to create" from the next menu, and then type in the name. The menu module will automatically add the final semicolon.

Every time you use a command in the menu mode, you learn that command simply because each menu choice shows it to you. What's more, you learn *Manager*'s syntax, partly because the menus ask for information in the order that the command line needs it and partly because the menu mode shows you the command as you create it. This is a nearly painless way to learn the program and be productive while you're learning.

Manager's menu mode also has at least one other trick worth mentioning: autoprogramming. Autoprogramming works much the same way that programs like *ProKey* work to create a macro on the fly: by recording commands as you type them for later playback. Even a nonprogrammer can create procedures in *Manager* by stepping through the menus and recording the commands. And once you create a procedure file this way, you can edit it at will. In my experience, this is an excellent way to learn new commands.

Both the command mode and the menu mode of *Manager* include a useful on-screen help feature, but significantly, these are unrelated to each other. In menu mode, the help feature consists of short, context-sensitive screens that give useful but minimal information. In command mode, asking for help with a particular command produces an exhaustive explanation of that command.

This command-based help is an on-screen version of the *Manager* reference manual and is actually more convenient to use. A nice touch here is a feature that will let you keep the help information on-screen while typing a command on the bottom line of the screen.

SOME SHORTCOMINGS *Manager* has more limitations than I'd like to see. Its data types are limited to alphanumeric or numeric, with no special provisions for date, time, or money fields. And the program won't add commas or floating dollar signs to a field. These and other minor drawbacks are tolerable, but the program also has two major shortcomings.

The *Manager* manual is almost exclusively a reference manual. It explains the *Manager* commands well enough, but it assumes you already know how to put a database system together. A 28-page tutorial introduces the mechanics of using the menu and command modes, but it does nothing to show you what you can do with the program. Such basics as how to create a custom menu are hidden in an appendix, where you'll probably never find them.

An even more important weakness is the lack of a good custom report generator. Creating a data entry form is straightforward and reasonably similar to typing the form on-screen. But creating even the sim-

plest report from multiple files requires programming.

Manager Software recognizes this as a problem and is currently working on a custom report generator. In the meantime, if you're more interested in managing your information on-screen than in printing it out or if you don't change your report formats too often, *Manager* is very much worth looking at. But unless you're already comfortable with programming and with database concepts, be sure to get the optional support.—**M. David Stone**

PC-DBMS

While some people need a relational database with a procedural language and extremely flexible reporting capabilities, others can get by quite nicely with something more modest. If your requirements fall into the first category, you should be aware that Kware's *PC-DBMS* lacks too many features for serious business applications. However, if you're looking for a relational database for personal use that is relatively easy to learn and master, *PC-*

DBMS may have the features you need.

PC-DBMS's main screen consists of three areas: one each for command entry and report generation and a small area between them for displaying program messages and field names. The only other screen is a no-frills data entry screen that also doubles as the update/query screen. The program makes adequate use of the Tab, Cursor, and function keys. For example, F1 brings up the help menu, F10 exits the program, and F3 recalls the last command executed to the command window, much as it does in DOS. *PC-DBMS* also comes with a well-written manual, a sample database, and a tutorial.

In *PC-DBMS*, you create a database by defining its tables (the equivalent of files) and fields in separate data entry screens. Because the table definition is simply a description of a file's structure, data files are essentially ASCII files of fixed length. *PC-DBMS* allows three types of fields: numeric, text, and filler. You can use fillers to mask unwanted fields from an existing ASCII file or insert blanks between fields. Index fields are declared either during the definition process or after the database has been created.


A QUERY LANGUAGE Instead of a menu-driven interface, *PC-DBMS* offers a flexible query language. The language consists of 25 key words, 11 of which are commands. Certain commands, such as Open and Exit, are intuitive; others are almost so, such as Select, which retrieves data, and Key, which indexes fields. When Selecting data for a process, you can set up to ten conditions by using the key word Where and the Not, And, and Or operands. Two of the eight comparison operands allow you to search a field for the inclusion or exclusion of a character, word, or phrase. In addition, you can sort up to five fields at a time in ascending or descending order. You should note that the results of a sort are permanent only if the output is defined as a text file or a new table within the database.

LIMITED CAPABILITIES *PC-DBMS's* major limitations are its lack of a way to perform arithmetic calculations and its inability to create professional reports. (The author does intend to include calculated fields in the next version.) Because of these limitations, I was unable to generate a report with proper headings, break fields, and totals. It took me a total of 11 very long minutes to join selected fields from the Person and Department files into an intermediary table, which was then used along with the current salary field in the Salary file to form a Report file. Also included within that time frame is the time necessary to index the department number fields in the first two files and the employee-number fields in the intermediary and Salary tables.

Although the results of the report could be imported to a spreadsheet or word processor for final processing, the entire process of generating the report and then messaging it is too cumbersome and time consuming to be done on a regular basis.

In spite of its limitations, *PC-DBMS* is a respectable relational database that offers some of the features found in more expensive programs. You should definitely look into it if your needs are modest and your system either runs under DOS 1.1 or is floppy-based and has limited memory. At \$35, *PC-DBMS* gives you your money's worth but not much more.

—Vincent Puglia



FACT FILE

Early Release

PC-DBMS

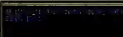
Now with compatibility
changes for personal computers

version 1.2

PC-DBMS, Version 1.2

Ware
P.O. Box 16206, Arlington, VA 22215, CompuServe 74216, 3033
List Price: \$35, user-supported **Requires:** 192K RAM, one disk drive,
DOS 1.1 or later **In Short:** Ware's *PC-DBMS* is a user-supported, query-
language-based relational database that permits two tables to be open at a time,
but it lacks arithmetic
functions and has limited
reporting capabilities.
Not copy protected.

CIRCLE 854 ON
READER SERVICE CARD



Help:
Press help
to go on
to go off
to abort

The report shown was generated by the PC-DBMS command line in the upper window. Note the on-screen function key assignments.

■ RELATIONAL DATABASES

PC-FILE/R

PC-File/R is a relational database from Jim Button of ButtonWare Inc., whose *PC-File III* has already earned a niche in PC history. Unlike ButtonWare's earlier program, however, *PC-File/R* is not "user-supported" software that you can download from public bulletin boards and freely copy and distribute. But its low cost makes this package ideal if you want sophistication without complexity. *PC-File/R* is generally easy to use, and it's very fast.

Part of its speed is due to no-nonsense indexing. *PC-File/R* automatically creates and maintains a separate index file that contains the first two characters of every field in a data file. When you sort a file, you're actually sorting the index. After you sort on a field, you can use a binary search feature for finding records. In the timing charts the two "retrieve and display" timings normally done with and without an active index were determined with and without *PC-File/R*'s binary search. With the file sorted by last name, a binary search by last name went so fast I had difficulty timing it.

PC-File/R's relational capabilities complement other sophisticated options in both data input and report generation. While *PC-File/R* is generally quite versatile, some reporting limitations showed up in the program during PC Magazine Labs testing. *PC-File/R* normally supports group highlighting, which means that a field repeated consecutively in a report will be suppressed except for the first occurrence in a page. But you can specify group highlighting only for a field in the current file and not for a relational field.

NO SUBTOTALING The PC Labs test also showed that the program cannot subtotal or sum a relational field. You can circumvent both these problems by "cloning" the related files into one single file and printing the report from that. If this procedure sounds like a nuisance, you're right, but since the resultant file is just a simple flat file, printing it out is easy and quick. *PC-File/R's* keyboard macros also help to automate the process.

You can save a report definition, but this definition involves mostly just how the fields are derived. Group highlighting, page breaks, and subtotals are not part of

the saved-report definition, which comprises questions asked each time before the report is displayed.

MINI WORD PROCESSOR If you save a format and later want to edit it, you'll probably first try to use the "mini word processor" included with *PC-File/R*. This program, developed separately from the database manager, has an entirely different command structure with its own conventions and its own learning curve. For instance, within most of *PC-File/R*, you can type Alt-H to bring up some help information. Within the mini word processor, you press F1. Unless you really want to learn how to use this editor for other word processing tasks, you'll be better off exiting *PC-File/R* and using ED-LIN or another ASCII text editor to edit report formats.

Apart from the mini word processor, the command structure in the rest of *PC File/R* is generally consistent. The only place I encountered some problems was in jumping from one part of the program to another. Sometimes you can press Esc to return to the main menu, at other times F10, and sometimes the menu option F (for File) will do it.

You'll quickly get accustomed to any quirks. The ease of use of *PC-File/R* makes it an excellent package for someone with no database experience who fears that a nonrelational package would prove inadequate. —Charles Petzold

PERSONAL PEARL

Personal Pearl from Pearlsort is another of the venerable database managers that have been around since the early years of micro-computerdom. It's available on a wide range of CP/M and DOS micros. The program has a lot going for it, most significantly one of the easiest ways to link multiple datafiles relationally. Easy to learn and use, it creates good-looking reports with a minimum of fuss and bother.

The latest version of the program uses the PC's function keys, but compared with an old CP/M-80 copy, the design hasn't changed very much. In light of its easy relational file-linking, that's not entirely a bad thing. *Personal Pearl*, which is not



FACT FILE

PC-File/R, Version 1.0

ButtonWare Inc.

P.O. Box 5786, Bellevue, WA 98006; (206) 454-0479

(800) 1-BUTTON (orders only): List Price: \$149

In Short: Speed, ease of use, and reasonable cost make this relational

EMPLOYEE	EMPID	LASTNAME	SALARY
counting	10000	Smith	10000.00
counting	10001	Smith	10000.00
counting	10002	Smith	10000.00

CIRCLE 686 ON
READER SERVICE CARD

The PC-File R column report format can pull in data from other files. Notice the "?NO DATA" entry in the Salary column.

[illegible]

Every thing is 4



copy protected, reveals its roots by awaking with an old-style terminal installation menu. A program that verifies, copies, and proceeds automatically manages installation.

The preferred method of executing *Personal Pearl* is for you to type command lines at the DOS level (some programs link to others through menus as well). Within the various program modules, short and simple menus control option selection. This interface style isn't totally consistent, and issuing the appropriate commands from DOS is cumbersome, but overall the interface works acceptably.

FORMS ORIENTED Pearl is forms oriented. You point your forms layout with simple and obvious procedures, then specify field characteristics after the form is laid out. The program supplies only character, numeric, and date field types, which is really not adequate for any product hoping to compete in the business market. You can require the program to enter something in a field, but no other input checks or validations are available. The same form is used for both data input and editing. Output reports are designed in an almost identical manner (you can even use the input form for reports if you wish). The program offers no provision for using the PC's graphics characters to design forms.

Each field can be either a unique or a nonunique index. Importing existing data can present problems if nonunique data is to reside in a field established as unique. There's no problem when you enter all data within the program. Incidentally, *Personal Pearl* itself cannot import data; you must buy a \$100 utility that can import only standard ASCII files (that's a bit annoying given the package's claim that "no add-ons are required"). The import utility is cumbersome, complicated, and inflexible, but it loaded the PC Magazine Labs data required for testing.

Setting up relations between files is extremely easy. First you specify the field desired in the "master" form. You then indicate both which form the data is to come from and whether that data is to be used as the link to locate data in the secondary file, to be displayed, or to be displayed and edited. All relational database systems should be as easy to link. Other



FACT FILE

Personal Pearl, Version 2.11

Pearlsoft

25195 Southwest Pkwy., Wilsonville, OR 97070; (503) 682-3636

List Price: \$295

Requires: 256K RAM, two single-sided disk drives, DOS 2.0 or later.

In Short: Easy to use, this limited but handy old-timer handles multifile relational tricks and creates handsome reports effortlessly. It's CP/M-style design has been nicely transformed for use by DOS machines. Not copy protected.

CIRCLE 88 ON READER SERVICE CARD

Personal Pearl's form-oriented data entry screen illustrates the program's ease of use. However, this is accompanied by a somewhat limited range of field criteria.

handy features include easy field-by-field carryover from the previous record during data entry, and the ability to extract information with DOS-style wildcards or "key word" substring searches.

■ The latest version of *Personal Pearl* uses the PC's function keys, but the old CP-M design hasn't changed much.

The only major problem is the ugly mailing labels the program creates. There's no way to trim trailing blanks, and so city, state, and ZIP code are widely spaced and you can't exclude empty lines. The manual even suggests that you use this unacceptably unattractive format in form letters, where it would stand out even more.

TESTING Defining the standard PC Magazine Labs test report for Category 2 database managers was quite easy. I experienced no significant difficulties, and the report ran as expected. Since indexing and sorting are automatic and embedded within the data entry and reporting processes, I couldn't time them separately. The report generation was on the slow side, but the ease of structuring the report compensates somewhat.

A disk tutorial that is really more a demo program comes with *Personal Pearl*, but the major tutorial is printed in the manual and requires several hours to execute fully. It covers nearly every aspect of *Personal Pearl* operation clearly, although the manual's reduced type is sometimes hard to read.

The *Programmers Development Toolkit*, available from Pearlsoft, enables you to create standalone applications using *Personal Pearl* as the foundation. PC Labs didn't test the toolkit, but at \$895 it seems rather costly when compared with some of the truly programmable database systems available.

Personal Pearl is a limited system in many ways, but it can handle some rather

■ RELATIONAL DATABASES

sophisticated multifile relational tricks painlessly. Although the program hasn't grown or progressed very much—especially compared with some of its new competitors—nonprogrammers will find that it still has a lot going for it.—Glenn Hart

POWER-BASE

Power-base with DataZoom just seems to get better and better as it gets older. Certainly, if the independent sales charts are to be believed, it's becoming ever more popular among business users. And why not? This is a beautifully written system that's well documented and easy to use.


Power-base is a menu-driven, relational database management system without its own programming language. There have always been plans at *Power-base* Systems (now a division of CompuWare) to bring out a version with a programming language, but the need for such a version seems to have diminished as *Power-base* matured. It's difficult to imagine an application that can't be put together with the *Power-base* menu—unless you want to design an application for a third party that has to "look" as if it's programmed from scratch.

POWER-BASE'S STRONG POINTS

Part of *Power-base*'s strength is in its beautiful prompting and on-line help. This prompting begins with file creation (through screen painting) and ends with complex report generation. Every step along the way, including data import and export in most known exchange formats (such as DIF, SYLK, and ASCII) and establishing relationships among files, is similarly supported.


In fact, most users need only run an hour-long on-line tutorial to learn what they'll need to know for 90 percent of their day-to-day database operations. When they do turn to the documentation, they'll find a highly readable, well-organized and informational volume.

Power-base uses function keys to respond to prompts that always appear on the bottom line of the current screen. Function keys 9 and 10 are used sequentially to highlight command choices on the com-



FACT FILE


EDITOR'S CHOICE



Power-base, Version 2.2
CompuWare Corp.
32100 Telegraph Rd., Birmingham, MI 48010; (313) 540-0400
List Price: \$349 **Requires:** 320K RAM, two floppy disk drives, DOS 2.0 or later. **In Short:** A highly flexible database management package that features a DataZoom facility, which enables users to jump quickly from one file to another. Not copy protected.

CIRCLE 601 ON READER SERVICE CARD

Power-base's EDIT-SCAN feature provides you with a variety of options, including that of ZOOMing to another file that has been linked to this one through one of its fields.



mand line. Pressing function key 8 executes the highlighted command. A second prompt line explains what will happen if the highlighted command is executed. This line is also used to issue error messages and to suggest ways out of an error situation.

Sometimes *Power-base* uses the entire screen for information input. For example, when a field is being defined, you can assign entry rules and a value range and even draft a customized help message.

To help you do all this, the system asks if the value must be unique, fill the field window, be a required field, or be written in uppercase. It also lets you choose minimum, maximum, or default values. *Power-base* then builds its own code to handle your criteria. A similar system of defining fields would take hours of programming in other systems that require code for each operation.

Power-base actually helps you develop fully featured applications such as menus, I/O screens, forms and reports, the data files and their indexes, and collections of queries and output elements. Screens and their associated tables are developed as fast as you can type. As with some other highly

automated systems, indexing is so deeply integrated into the system that it is difficult to create an application for benchmark testing that does not use indexes. It's just not a normal operating mode for this particular product.

THE DATAZOOM FEATURE DataZoom is *Power-base*'s feature for accomplishing automatic finds in lower-level, related records. For example, suppose you have a sales staff file and a transaction file. Each file contains an employee number field.

When this application is first put into use, a screen is presented to display staff information. When you choose the DataZoom option, the system goes to the next level of attached files for the presently displayed record. For example, if you pressed DataZoom while looking at staff member C, that record would be replaced by the first transaction record associated with C. (You could not, however, move any further through these transaction records.)

It is possible to have a third- or even fourth-level file linked to transactions—take parts, for example. At any given transaction you would DataZoom again

and drop to the parts level. The whole process works in reverse as well.

Screens can be set up to show lower-level data on master screens, and reports can be generated that pull information from all active levels. Virtual, calculated, and lookup fields are all supported.

Power-base is one of those rare products that does everything its authors say it does: it does everything well and without hassle. The program has found much success as the workhorse database manager in operations that only use programmable systems for those rare, highly customized applications that *Power-base* can't handle. But the applications that *Power-base* can't handle are few and far between.

—Richard Aarons

PRODAS

When Conceptual Software Inc. described *Prodas* as a professional database analysis system instead of a database management system, it was right on target. High-powered *Prodas* offers virtually unlimited file, field, and record sizes—restricted only by available disk space—and includes an extensive statistics package. Typical *Prodas* applications include genetic analysis, hospital patient analysis, and oil-well drilling analysis.

The complete *Prodas* system consists of three major subsystems: the database manager, a statistics package, and a modest graphics package—all for \$1,485. The company also sells each of the three subsystems separately.

THE PRODAS DATABASE The *Prodas* database subsystem, Version 3.0, sells for \$720. Though expensive, it certainly merits your attention if you need to manage voluminous amounts of data. It consists of a group of database modules accessed through an interactive user interface, which requests the name of a module and waits for your input for that module. When you've completed the inputs, a Run command is issued and the module is automatically executed.

Currently, 16 modules are included in the database subsystem, including modules to convert between different database

formats, to quickly view, edit, and enter data into a database file, to produce quick one-file reports, to view file structures, and to sort databases. The Define module easily creates multikeyed, random-access files. Designated keys significantly speed up access to data.

THE PROGRAM MODULE The central module of the *Prodas* database subsystem is its Program module, a full programming environment that offers facilities for extensive user control of the database system.

The language takes getting used to. It encourages using Goto statements, and the code can get a bit unwieldy. A special language extension aids in full-screen and forms development. *Prodas* gives you a great deal of flexibility: you can open and link any number of database files. Once you open them, you can use the files for an application immediately.


The Program module issues most requests to access databases. For example, the system views these requests as programs to be executed. The following program inputs an external data file and creates a *Prodas* sequential file:

```
program:
  infile a:dept.sdf
  input depno $3.
  dname $16. ccent:
  create depnum;
  run;
```

When it receives the Run command, the Program module—much like a BASIC interpreter—executes the program. Since you can store and recall frequently used pieces of code as macros, you can easily design and build a library of personal data access tools.

For full programs and requests greater than ten lines, you need to use an editor to create a file. The file is then submitted to *Prodas* for execution.


THE LEARNING PROCESS Installing the program is simple, but the *Prodas* system takes time to learn, and programming experience helps considerably. The documentation includes a reference manual and a user's manual, neither of which has an index. Although at first I found myself endlessly searching through both books to find what I needed, finding most of the information became easy after several runs through the manuals.

**FACT FILE**

Prodas, Version 3.0
Conceptual Software Inc.
5022 Jason St., P.O. Box 56627, Houston, TX 77256; (713) 667-4222
List Price: \$720 Requires: 256K RAM, two floppy disk drives, DOS 2.0 or later.

In Short: Not for the novice, *Prodas* is a high-powered, flexible database system with emphasis on analysis; it offers unlimited file, field, and record sizes. Copy protected.

Circle 899 on Reader Service Card



Input Database: a:emplog.dat

Variable	Type	Length	Label	Format
empid	numeric	4		
empname	character	30		
empjob	character	30		
empdept	character	30		
empdate	character	30		
empstat	character	30		
empaddr	character	30		

Number of Rows: 2

Row 1 = consists of the following variables:
empid
empname
empjob
empdept
empdate
empstat
empaddr

Sample output of a *Prodas* Contents module request, which presents the structure of a given database.

■ RELATIONAL DATABASES

Importing data files takes two steps: first, reading data in through the Program module and creating a sequential database; second, using the Define module to set up a multikeyed file (indexes). You can also import or export files through the Transfer module, which will convert a number of standard formats.

PC Magazine Labs tested Version 3.0 of the program, but Conceptual Software is currently beta-testing *Prodas*, Version 3.10. The company says that it has includ-

ment of SQL enhances the overall SQL environment, which it calls the Interactive Structured Query Language, or ISQL.

SIMPLIFYING STANDARD FUNCTIONS At its basic level, ISQL provides for the standard facilities of SQL. In its simplest form SQL is easy to understand and easy to use. Data retrieval really requires nothing more than an understanding of what data is needed. SQL systems build and maintain fully relational tables within a database space. You don't have to keep track of separate files, such as employee files or parts files, as in *dBASE III*-type systems.

QINT/SQL performs standard SQL functions flawlessly. ISQL monitors SQL statements, allowing them to be debugged, stored, and recalled. ISQL commands control environment parameters, data formatting, basic functions for importing and exporting data and for developing routines, and sequences of SQL statements that are stored in a special routine table and can then be recalled and run. Routines can contain place holders, allowing for interactive input—a useful and timesaving fea-

ture worthy of imitation by others.

QINT/SQL also has a set of full-screen commands that allow for screen displays of tables similar to standard PC database management packages like *dBASE III*. But instead of offering tabular views, *QINT/SQL* provides for single-record inputting, viewing, and editing similar to *dBASE III*'s Edit and Append commands. You can toggle between standard or full-screen modes at will. There's no particular advantage to either method, though—it's simply your choice.

POWERFUL APPLICATIONS DEVELOPMENT *QINT/SQL* can therefore handle simple applications, but they're not the system's strong suit. The system is much more than SQL. In addition to ISQL, an integrated form and screen design tool called SQL/FORM combines SQL data-retrieval services, ISQL routines, and form and subform layouts (including full multiscreen layouts) into a powerful applications development system that will meet the needs of the most demanding user. Further, once an application routine has been fully debugged, *QINT/SQL* can compile it and then store it

■ The *Prodas* Program module is a full programming environment that offers extensive user control of the database system.


ed many enhancements in the new, soon-to-be-released version.

The *Prodas* system is absolutely not for the novice user, nor is it the database manager of choice for an experienced user who simply needs a mailing label system. But you'd be wise to investigate *Prodas* if you need to analyze information in large databases statistically or to manipulate very large databases with a great many fields (or variables) per record. That's where *Prodas* really shines.—Tony Rizzo

QINT/SQL

The *QINT/SQL* relational database system is a major step forward for IBM PC relational database systems. Its roots are in the PC, but recently Quint Data Base Systems Corp., the system's developers, ported it to UNIX System V and to DEC's VAX/VMS family.


QINT/SQL is built around IBM's Structured Query Language (SQL) technology and is in fact compatible with the IBM mainframe language. *QINT/SQL*'s imple-

**FACT FILE**

QINT/SQL, Version 2.12
Quint Data Base Systems Corp.
125 Roberts Rd., Waltham, MA 02154; (617) 891-3377
List Price: \$995 **Requires:** 512 to 640K RAM, one floppy disk drive and one hard disk drive, DOS 2.0 or later

In Short: An easy-to-use relational database with upward mobility to some mini- and mainframe systems and a strong suit in handling large operations. Not copy protected.

CIRCLE 648 ON READER SERVICE CARD



APPLICATION - DESIGN - TOOL
Copyright QINT Database System Corporation. (c) 1989

Type new user choice of (Flow) or (Routine) or (Main menu) ■

Input or Edit a Form.	Copy (part of) a Routine.
Input or Edit a Field.	Delete (part of) a Routine.
Input or Edit a Label.	Directing Routines per Flow.
The Screen-painter.	Input or Edit a Routine.
	Printing of a Routine(s).
	Renaming of a Routine.
	Re-numbering of a Routine.

More utilities for the user.

The *QINT/ADT* menu for designing applications includes options for both form and routine definitions.

in compiled form (yes, interpreted versus compiled routines). I tried this technique on several routines with good results and a noticeable decrease in processing time.

SQL/FORM gives you all the standard string and numeric functions, as well as an If statement that allows for conditionally executing SQL statements. The burden of typing commands is eased considerably by function and control key combinations. SQL/REPORT, an extension of the SQL/FORM tool, lets you print forms and

valuable, you don't have to be a DP person or programmer to use it. That selling point in itself may be worth the price of admission to QINT/SQL.—Tony Rizzo

R:BASE SERIES 4000

R:base Series 4000 is a less powerful (and less expensive) predecessor of *R:base Series 5000*. It lets you keep up to 40 files open and establish relationships between 4 of them simultaneously. Like the *dBASE* family, it is command-based and there are many unfamiliar commands to memorize. However, while the program will do the job, learning to use it may not be worth the trouble.

Part of the difficulty is that the *R:base Series 4000* format is considerably different from most other database management products. In the *R:base Series 4000* context, a database is not defined as a single file but as a set of up to 40 files that can be sorted, indexed, filtered, and linked together in different ways. Normally, this would not be much of a problem—in fact, the usefulness of the system can be a defi-

nite plus—except that Microrim makes it practically impossible to learn to use its product.

USING THE MANUAL I began my testing by penciling in an extensive list of changes and addenda to both the reference documentation and the separate tutorial manual. Nothing big, really. Just changing words like *off* to *on*, *yes* to *no*, *black* to *white*. This was somewhat disturbing.

Then I began the on-screen tutorial, setting up its files using instructions from one booklet and continuing the tutorial with another. I followed the manual exactly, but by page 6 my screen didn't look like the one in the manual, and things never got much better.

After many hours of little gain in the tutorial, I proceeded to the reference manual, which is not well organized and doesn't even contain the word *index* in its index, though indexing is certainly a major feature of the program (Microrim calls indexing "building a key," but I can't imagine how it expects a new user to know that). In any case, information is not easy to find, nor are the best examples used to illustrate key points.

■ *QINT/SQL* merits high marks for managing large projects, and you don't have to be a programmer to use it.

nested forms. The combination of QINT/FORM and QINT/REPORT can handle most situations where lesser systems must resort to a procedural language. Therefore, the fact that QINT does not have a built-in procedural language is of minor consequence for most applications.

ROOM FOR IMPROVEMENT The shell the company calls QINT/ADT (for Application Development Tool) prompts you through form and routine development. A major complaint: the graphics technique used to frame ADT prompts is horrendously slow.

There's plenty of room for improvement in the manuals. Although the QINT/FORM manual I received clearly mentions that the documentation is preliminary and might contain typos, the *QINT/SQL* manual doesn't. With its many typos, it is really substandard for a \$995 package. Typos in command syntax descriptions are especially annoying.

Nevertheless, *QINT/SQL* merits high marks for managing large projects, especially in light of its upward mobility across PCs, UNIX System V, and VAX/VMS systems. I found the system easy to use, and although previous experience might be



FACT FILE

R:base Series 4000, Version 1.15

Microrim Inc.

3380 146th Place S.E. | Bellevue, WA 98007; (206) 641-6619

List Price: \$495 **Requires:** 256K RAM, two floppy disk drives or one hard disk drive, DOS 1.1 or later, CTOS (8.0), BTOS (8.0).

In Short: A less satisfactory predecessor to *R:base Series 5000*, this product offers a large variety

of commands but little help in how to use them. Not copy protected.

CIRCLE 600 ON READER SERVICE CARD

R:base Series 4000 produces rather plain-looking reports, as illustrated here by an alphabetized and extremely simplified employee list.

■ RELATIONAL DATABASES

FINDING YOUR WAY *R-base Series 4000* does have two modes that help the first-time user enter commands with the proper syntax: help and prompt. By typing either word you are presented with a screen listing *R-base Series 4000*'s command words. To receive a paragraph of further explanation about any command in the help mode, you simply type the name of the command. Prompt mode is similar, except it will actually step you through the complete entry of any command—and this is the friendliest, most useful aspect of the program. In fact, experimentation in prompt mode is the best way to learn the program, given its inept tutorial and reference documentation.

Creating databases and custom screen input forms is not as easy or obvious as in many other programs, but *R:base Series 4000* is powerful in these areas. Input forms can use as many screens as you like, using full names for field prompts and lists of rules for data entry. For example, I created a rule for a field that, when skipped by the user, produced the message: "You may NOT skip this field. Please enter the customer's last name." *This I could appreciate.*

CREATING FILES AND WRITING REPORTS *R:base Series 4000's* extensive

command language allows you to create program files or lists of instructions. Using such files or lists, you can combine simple-to-operate input and editing screens with a powerful relational database system, eventually building up a "foolproof" business system for noncomputerists. Or you can create command files to automate everyday procedures. Once you understand how to operate *R:base Series 4000* from the command prompt, writing program files is not difficult.

The low point of this program is its report writer. You really can't generate much more than plain-looking reports, and you end up feeling that your database is holding out on you. The information is there; you just can't get it printed in a sufficient variety of formats. The real problem, however, is that the report writer's functions are so awkward you don't *want* to use them. You must locate attributes and variables and mark them with an S for start and an E for end. The result is an ugly-looking



FACT FILE

RTFILE, Version 8.9

Contel Business Networks Inc.

4330 East-West Hwy.; Bethesda, MD 20814; (301) 654-9120

List Price: \$500 Requires: 256K RAM, hard disk drive, DOS 2.0 or later

In Short: A powerful, highly structured environment for sophisticated users, this relational database works on both DEC minis and IBM PCs; you may sacrifice some speed and flexibility, but when it gets down to generating reports, *RTILE* has just what it takes. Not copy reprinted.

CIRCLE 627 ON
READER SERVICE CARD

RT:FILE's powerful report generator allows you to quickly specify a number of report criteria and mathematical relationships.

[illegible]

screen that doesn't look anything like the finished product. The only way to get used to writing reports is by writing reports—hundreds of them—and if you're like most business people, you just won't have the time to do that.

If you've got the "disorganized data" fever, *R-base Series 4000* has a cure. It's an efficient way to manage large business applications and to tailor systems to individual levels of user sophistication. However, the difficulty of learning to use the program to its fullest extent is a serious flaw that Microrim should take note of.

—Phil Wiswell

the vendor, Contel Business Networks, *RTFILE* for the PC is a faithful implementation of *RTFILE* on larger machines. But this relative newcomer to the *RTFILE* family hasn't learned all the ropes quite yet.

RTFILE is a powerful, highly structured environment in which unsophisticated users will find themselves overwhelmed. Even the single-user version of the program retains many features found in multiuser systems: users must sign on with an approved user ID (such IDs can be coded to prevent users from breaking through to the operating system), program operations and data files are protected with access codes, and an option allows you to automatically log data file access by user ID, date, time, and operation performed. Although you can do a lot more to make such an environment more palatable, it lacks an integral programming language that could tame the complexity while preserving the power. Instead, **RTFILE** offers interfaces to high-level languages such as Microsoft Pascal and FORTRAN.

RTFILE, Version 2.0, makes it possible to use one database product on both IBM PCs and DEC minis. According to

In the absence of its own language, *RTFILE* requires one of the other elements of a multiuser system: a database administrator. This person must not only assign

IDs and access codes to new users but structure files, design and develop input forms, queries, and reports, and assign them appropriate read/write access levels. Data files must be dimensioned to the number of records they will hold at the time of creation. When a file reaches its limit, someone must extend it. A system file tracks all files created in the database, and this file, too, has a limited number of records. When it fills, no files may be added until it is redimensioned, but doing so incorrectly can wreak havoc on your entire database.

APPLICATIONS DEVELOPMENT

Setting an application in *RTFILE* is a bit like playing Tarzan. Sometimes you can swing through the database treetops unfettered; at others you'll have to hack your way through the undergrowth, byte by byte. While you have the freedom to do such things as suppress the display of fields, assign fields "must enter" or "must fill" status, and control whether an operator has the privilege to inquire into or delete records, you must also put up with long and rigidly sequential processes such as report definition, where one error can mean you must finish out your definition knowing you are going to have to start all over again. Editing such definitions the second time around is no better, and in some cases even the forgiveness of the Backspace key will desert you.

All display screens, sorts, and reports are defined and stored in separate files. Without rigorously applied naming conventions, you'll soon find yourself floating in a sea of names with no idea what name pertains to what. Worse, in the many instances that *RTFILE* requires you to provide such names, it never offers a list of possibilities. If you forget a field name in the midst of defining a report, you can forget that report definition until later.

WHAT CAN IT DO? So much for means. What about ends? *RTFILE* can perform ad hoc queries only on indexed fields, and such queries can search only for an exact match on a single indexed field. You can simulate the effect of a wildcard by truncating the right-most characters from a search specification, but you cannot do the same for the left-most characters.

Indexed searches using compound criteria or relational operators are out; so, for example, you could not ask to find customers in the Northeast region who bought more than \$5,000 worth of merchandise (that search request is both compound and relational). Such a search is possible, but you must predefine and store it before you can use it, and then sacrifice the speed of an indexed search when you do. This kind of predefinition also comes at some cost in flexibility. While you can redefine any

■ *RTFILE* is a powerful, highly structured environment in which unsophisticated users may be overwhelmed

stored query, you cannot do so on the fly; you must first exit to the appropriate section of the program.

When you do get down to reporting, *RTFILE* has what it takes. The program allows you to define so-called logical files by joining up to five conventional data files. Files must, of course, be linked on a common field, but only one end of that link must be indexed, a nice savings in consideration of the program's five-index-per-file limit. Thereafter, a single report can access any field contained in any of the linked files that comprise the logical file, up to a maximum of 30 fields.

While *RTFILE* does not support compound indexes, it does offer ten levels of sorting, with each level ordered independently of others. Stored sort and query specifications can be associated with report specifications or supplied at run time. *RTFILE* also offers a side-by-side printing format for three-up labels, a quick single file report, and free-form mail-merge applications using separately prepared text files (*RTFILE* does not have an editor).

SHAKEDOWN CRUISE This version of *RTFILE* is a newly released product still on its shakedown cruise, and numerous

bugs surfaced during this review to prove it. The PC Magazine Labs data files, once imported, could not be indexed owing to a bug that made the program claim such indexes already existed. The default destination for reports is LP, a device name left over from one of the other operating systems on which *RTFILE* runs, but not a DOS device name. Unless you know to change that default to PRN (the reserved name for the PC's printer), *RTFILE* will blissfully dump your reports in the bit bucket. Exiting from one menu repeatedly caused half the screen to disappear, files that were supposedly deleted could not be re-created, a record-locking error surfaced in a single-user application, and (although this is ostensibly not a bug) an unusual data entry methodology makes it very easy to enter numeric data incorrectly. The program's publisher says it is its policy to fix any problems at no charge, and although it is obviously committed to the product line, deadlines prevented me from seeing a fixed version.

Contel Business Networks also offers a multiuser version of *RTFILE* running on Ethershare. Once the publisher has attended to the wrinkles in this version, *RTFILE*, augmented with the proper database administrator, will provide a consistent environment for those using minicomputer-based versions of the program. Although at some cost in flexibility, the program will also be appropriate for any organization needing a well-regulated relational database.—David Hoffman

SIX

SIX is a surprisingly powerful relational database program designed for people who want to build fairly complex applications without having to learn a programming language. A menu-driven system with six main modules (hence the name), *SIX* is powerful enough to create complicated order-entry and inventory systems, yet easy enough for a computer novice to handle.

DESIGNING A DATABASE Designing a database with *SIX* is easy and straightforward. Following the program's prompts, you create data entry screens analogous to

■ RELATIONAL DATABASES



FACT FILE

SIX, Version 6.4

ASAP, Inc.

1041 41st St., Suite E: Santa Cruz, CA 95062; (408) 476-3935

List Price: \$395 **Requires:** 192K RAM, two double-sided disk drives, DOS 2.0 or later. **In Short:** A well-organized relational product that makes it easy for computer novices to organize interdependent data. This friendly database was recently re-

named **UNIVERSAL** base **SIX**, which perhaps refers to its wide range of usefulness. Copy protected.

Circle 692
ON READER SERVICE CARD

SIX's Query command quickly lists all records that meet your selection criteria. In this case, all employees with salaries over \$50,000.

ROW	EMPLOYEE NAME	EMP #	LAST NAME	SALARY
1	Production	1001	Thomas	55000
2	data processing	1002	Williams	52000
3	Shipping	1003	Gray	51000
4	data processing	1004	Smith	50500
5	Production	1005	Steele	50000
6	Accounting	1006	Clark	49500
7	Production	1007	West	49000
8	Shipping	1008	Greenham	48500
9	Shipping	1009	Ball	48000
10	data processing	1010	Wright	47500
11	data processing	1011	Long	47000
12	data processing	1012	Young	46500
13	data processing	1013	Smith	46000
14	data processing	1014	Smith	45500
15	data processing	1015	Smith	45000
16	data processing	1016	Smith	44500
17	data processing	1017	Smith	44000
18	data processing	1018	Smith	43500
19	data processing	1019	Smith	43000
20	data processing	1020	Smith	42500
21	data processing	1021	Smith	42000
22	data processing	1022	Smith	41500
23	data processing	1023	Smith	41000
24	data processing	1024	Smith	40500
25	data processing	1025	Smith	40000
26	data processing	1026	Smith	39500
27	data processing	1027	Smith	39000
28	data processing	1028	Smith	38500
29	data processing	1029	Smith	38000
30	data processing	1030	Smith	37500
31	data processing	1031	Smith	37000
32	data processing	1032	Smith	36500
33	data processing	1033	Smith	36000
34	data processing	1034	Smith	35500
35	data processing	1035	Smith	35000
36	data processing	1036	Smith	34500
37	data processing	1037	Smith	34000
38	data processing	1038	Smith	33500
39	data processing	1039	Smith	33000
40	data processing	1040	Smith	32500
41	data processing	1041	Smith	32000
42	data processing	1042	Smith	31500
43	data processing	1043	Smith	31000
44	data processing	1044	Smith	30500
45	data processing	1045	Smith	30000
46	data processing	1046	Smith	29500
47	data processing	1047	Smith	29000
48	data processing	1048	Smith	28500
49	data processing	1049	Smith	28000
50	data processing	1050	Smith	27500
51	data processing	1051	Smith	27000
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56	data processing	1056	Smith	24500
57	data processing	1057	Smith	24000
58	data processing	1058	Smith	23500
59	data processing	1059	Smith	23000
60	data processing	1060	Smith	22500
61	data processing	1061	Smith	22000
62	data processing	1062	Smith	21500
63	data processing	1063	Smith	21000
64	data processing	1064	Smith	20500
65	data processing	1065	Smith	20000
66	data processing	1066	Smith	19500
67	data processing	1067	Smith	19000
68	data processing	1068	Smith	18500
69	data processing	1069	Smith	18000
70	data processing	1070	Smith	17500
71	data processing	1071	Smith	17000
72	data processing	1072	Smith	16500
73	data processing	1073	Smith	16000
74	data processing	1074	Smith	15500
75	data processing	1075	Smith	15000
76	data processing	1076	Smith	14500
77	data processing	1077	Smith	14000
78	data processing	1078	Smith	13500
79	data processing	1079	Smith	13000
80	data processing	1080	Smith	12500
81	data processing	1081	Smith	12000
82	data processing	1082	Smith	11500
83	data processing	1083	Smith	11000
84	data processing	1084	Smith	10500
85	data processing	1085	Smith	10000
86	data processing	1086	Smith	9500
87	data processing	1087	Smith	9000
88	data processing	1088	Smith	8500
89	data processing	1089	Smith	8000
90	data processing	1090	Smith	7500
91	data processing	1091	Smith	7000
92	data processing	1092	Smith	6500
93	data processing	1093	Smith	6000
94	data processing	1094	Smith	5500
95	data processing	1095	Smith	5000
96	data processing	1096	Smith	4500
97	data processing	1097	Smith	4000
98	data processing	1098	Smith	3500
99	data processing	1099	Smith	3000
100	data processing	1100	Smith	2500

INDEXING AND RETRIEVING *SIX* provides a number of different ways to pull information out of your database. The simplest and fastest method is to use indexed data fields, typing the information you want to match on a blank data-entry screen. If you want to search for information in a nonindexed field, you can use relational operators (such as "greater than" and "equal to") and wildcards to look for matching items. This kind of search can take a while (almost a full minute in our 500-record test database), so you'll probably want to index all of the fields that you plan on searching frequently.

If you want to look at a number of records that match your selection criteria, you can use *SIX*'s Query module. Query lets you use Boolean and relational operators to define selection criteria. It then displays all the records that meet the criteria in a spreadsheet-like format. Once you've retrieved the desired subset of your database, you can perform global updates, such as increasing all of your prices by 10 percent.

SIX has several report options that cover most of the commonly used business reports. There is a Quick Report format, which simply lists all of the data in the database that matches a certain data entry screen. There are also custom reports that you define and store. Like the Screen Design module, the Report Design module allows you to "paint" your desired report on the screen. A "report table" that lists the data items in your report lets you indicate selection criteria and sorting instructions and desired totals and averages.

Label preparation is similar, except that *SIX* reminds you of the size of your label by drawing a box on the screen, in which you enter your label information. As with the custom reports, you can type in text as well as variable information.

SIX's manual is well organized and well indexed, with a tutorial that leads you through the basic functions. I would have appreciated more examples in the reference section, but I didn't run into any major snags.

Like sports-car fans who wouldn't dream of driving a car with an automatic transmission, programmers might reject *SIX* because it doesn't give them the control offered by a procedural language. However, if you don't demand that level

your existing paper forms. If you're not fussy about how your screen looks, you can use *SIX*'s automatic screen design, which centers each data field on the screen. If you want something fancier, you can "paint" the screen by typing the desired prompts where you want them to appear. You don't have to worry about getting everything right the first time, because it's easy to modify the data screens.

Each screen can contain up to five indexed data fields. But unlike the indexes in a flat file system, the indexes in *SIX* allow you to create "one-to-many" and "many-to-one" relationships among your data. For instance, suppose you wanted to keep track of your employees' salary histories. You could make "salary change date" an indexed field on your screen. Then, by placing the cursor on that field, you could page through all of the salary changes recorded for that employee.

Once you've designed your screens, *SIX* automatically maintains the relationships between all of the items in your database; thus you never have to issue a "join" command to connect separate data files. The data is always interconnected in what database designers call "third normal

form." So, if you change an address on a customer information screen, the new address will appear when you type in the cus-

■ *SIX* lets you create your own menu-driven systems that bypass the program's native menu structure.

tom number on an invoice screen. *SIX* can also maintain cumulative totals using information from different parts of the database, allowing you to automatically update your inventory whenever you use an order entry screen.

Although you can maneuver through the program's menus, *SIX* also gives you the option of creating your own menu-driven systems that bypass the program's native menu structure. Once you construct your data entry screens and your reports, *SIX* will use your customized menus to let a less-experienced operator run the system.

of control and if your applications use interdependent data fields, you may find that *SIX* has all of the power you need.

—Dara Pearlman

XDB

XDB is a full-function relational database manager based on IBM's Structured Query Language (SQL). *XDB*'s designers at Software Systems Technology Inc. have enhanced that well-known mainframe program by providing a friendlier, menu-driven interface and on-line help displays.

XDB allows data entry, form creation, and report generation in a purely interactive mode. In addition, a procedural language is included that allows you to create custom applications if desired.

XDB provides the sort of flexibility expected from a sophisticated database manager without requiring you to write programs. Twelve files can be joined at one time, although information can be simultaneously extracted from only two of them at one time. Files can be indexed on one or more fields, and indexes can be added or

deleted as necessary. The structure of a file can be modified at any time. *XDB* supports four numeric data types, including floating-point numbers to 12-digit precision, along with date and character data types.

FILE MAINTENANCE WITHOUT DOS The program is easy to install, even though each data disk must be initialized before it can be used because *XDB* maintains its own files to keep track of data rather than depending on DOS's built-in facilities. The drawback to this method is that you cannot use DOS to copy data files; you have to use the copy utility built in to *XDB* instead.

When I reviewed *XDB* this time, it did not support DOS paths in file specifications. This limitation should be lifted in Version 2.0 (available this summer along with a network version), according to Software Systems Technology. The inability to send setup codes to the printer will also be addressed in the new release.

XDB is both menu- and command-driven. You can get to any area of the program through menus, while queries are generated by typing English-like commands into a full-screen editor. The program is interac-

tive in the sense that, after seeing the results of a query, you can return to the editor, modify, and reexecute the queries until you get the desired result. Queries can also be saved at any time.

A POWERFUL INTERFACE *XDB* provides a powerful interface for creating customized forms and reports, as well as a utility for creating menus. The form generator has some of the program's most impressive features. "Lookups" are allowed in up to 10 other files, and a single form can dynamically update data in up to 12 files. Fields can be computed from entered data. *XDB* provides full error checking and edit masks for formatting data.

The report generator allows grouping and subgrouping, with totals, counts, averages, minimums, and maximums calculated at each level of grouping. During the report creation process, *XDB* creates code in its own procedural language that you can use or modify at a later time. Command files use the standard DOS format, so they can be created or edited with almost any text editor. In fact, *XDB* can be configured so that your favorite editor is substituted for its own whenever the editor is invoked from the menu.

Beyond its built-in language, *XDB* provides an interface to the C programming language. The program includes a disk with libraries of routines that offer the C programmer complete control over the database.

Context-sensitive help screens are available from any menu by hitting the Question mark key, and a Tutor option provides descriptions of the query and data-manipulation commands.

XDB includes a graphing module that allows formatting of up to six columns of data. Graph types include pie, bar, line, and x-y plots and can be viewed on a graphics monitor or a dot matrix printer.

The creators of *XDB* have set their sights high and claim in no uncertain terms that their product is in a league with the likes of *dBASE III*, *R:base*, and *KnowledgeMan*. The program is in its initial release after 2 years of beta testing, so it is too early to say if it will stand up to these claims in the marketplace. It does, however, seem to have the technical tools to do the job. —David Hoffman



FACT FILE

XDB, Version 1.00M

Software Systems Technology Inc.

7100 Baltimore Ave., #206; College Park, MD 20740; (301) 779-5846

List Price: \$750 Requires: 320K RAM, two disk drives, DOS 2.0 or later.

In Short: *XDB* is a new database manager with a good user interface, solid file management, and a lot of promise in a competitive marketplace. It's based on IBM's Structured Query Language. Not copy protected.

CIRCLE 667 ON
READER SERVICE CARD

XDB's full-screen editor for entering commands. This sequence of commands creates a new table, called PD, with data pulled from the "person" and "dept" files.



This is Great! - here there is a new version now - only 39.95 + 5/handling

OK TO ORDER

REPRINTED FROM

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SEPTEMBER 10, 1985

VOL. 2 NO. 38

THE NATIONAL NEWSPAPER OF IBM STANDARD MICROCOMPUTING

'PathMinder' Tool Handy for Making Hard Disks Easier



JIM SEYMOUR

whom they're only distantly related.

Finding a Winner

PathMinder, from Westlake Data, is a perfect example of such a winner—a power tool far better than anything like it on the market, but one which suffered from being second (or maybe fifth or eighth) of its kind to market. On the surface it looks like a DOS command shell; in practice, it's a sophisticated disk manager, a nearly indispensable tool for hard-disk users.

Bourbaki's *l'air* was the first "disk manager" utility I saw, and it was and remains a good product. But *l'air* suffers from a problem I find almost universal among command shells: After a while, you begin finding it tiring, and eventually find you don't use it much any more.

By contrast, *PathMinder* is so fast, convenient and useful that I use it constantly, and can no longer imagine trying to run a large-capacity hard disk without it. The program uses windows for lists of directories, subdirectories and files, and lets you move things among them quickly with a Lotus-like menu across the top of the screen. You can execute almost anything possible within the DOS command set (except a single-step, copy-and-rename operation) by simply hitting the first letter of the English-language term for what you want to do.

Because it's memory-resident, *PathMinder* runs lightning fast; because it follows the DOS rules, it runs without almost anything you can add to a disk.

The program is full of nice touches. A very good screen-oriented editor lets you *tear up* .BATs and add new features

to your AUTOEXEC and CONFIG files without having to boot up your favorite plan-ASCII word processor or COPY CONING.

The BAT-file copying and BAT-file erasing capabilities of *PathMinder* are alone worth the price. You can erase groups of files, or move groups of files from any directory, on any disk, to any other—without playing Wildcard Koolhaie.

An encryption routine scrambles data very nicely. An applications-menu generator lets you hide *PathMinder* from the casual user, while delivering its power to its users. A user log tracks who used the computer for what, how long and for whom.

I don't know DOS like the guys at Microsoft, but I don't have any trouble remembering how to CD, MD, DIR, TYPE and ASSIGN my way through sessions at the computer. But with rare exceptions, I still let *PathMinder* handle the dirty details of command syntax. And for those exceptions, I use *PathMinder's* copy-window-into-DOS facility to type in my most bizarre maneuvers.

Nothing's free, and while *PathMinder* only costs \$39.95, it does use up memory now down to about 20K bytes after a recent recompilation. Thanks, NIK, well-said, I'd say—that, from someone who refuses to use a disk-accessory program (and doesn't routinely load a macro program because he won't give up the memory).

You don't need a disk manager to survive close encounters of the hard-disk kind. But if you've never seen *PathMinder*, you owe it to yourself to take a look at the state of the art in Making Life Easier. ■

Jim Seymour writes the syndicated newspaper column, "Microbusiness," and helps corporate clients keep their microcomputer assets happy.

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Third-party software developers have given dBASE programmers all kinds of options: compilers to speed execution of dBASE code and dBASE clones whose language extensions can be valuable.

ADDING SPEED AND FUNCTIONS TO dBASE

Using an industry standard like Ashton-Tate's dBASE line of database management systems can be a major advantage when developing applications because of the wide array of help available to you from third-party software vendors. With their products, you can add functions, generate code automatically, and generally do all kinds of things not included in the basic dBASE product. Perhaps best of all, you can choose variations on the language itself from among such third-party language systems as the ones reviewed here.

All languages, no matter how they are executed, translate the series of statements and commands you've written (known as source code) into instructions the computer can execute. Since the computer only understands strings of bits, this translation process is essential to allow you to pro-

gram in a (human) readable manner and with a minimum of effort.

TRANSLATION METHODS There are two primary translation methods: interpretation and compilation. As with most things, all is not necessarily black and white, and there are some shades of gray between these two. And as usual, there are trade-offs with both approaches that primarily affect your programming time, the size of your final application, and the execution speed of the final program.

Interpreters examine every character of your source code when you run the program. The interpreter determines what you intended your source code statements to do and sends the appropriate instructions to the computer. If you have a loop that executes something 100 times, the interpreter will translate each line of source code 100

■ ADDING TO dBASE

times, which can be a slow process. Even spaces, comments, and indentation must be scanned in the translation process, and so these aids to readable source code programs add to execution time as a result.

A major disadvantage for systems developers is that interpreters often require the original source code to be available when the program is run. That means you may be giving the user your secrets—a real problem when you develop programs for sale. Another disadvantage is that the user must buy a copy of the interpreter as well as your program.

On the other hand, interpreters are by nature interactive. You can halt execution

■ With these products, you can generate code automatically and do all kinds of things not included in dBASE.

manually, examine the values of variables, make changes to values or source code statements, and restart your program. This interactivity makes it easy to develop applications because you can test programs as you create them.

COMPILING PROGRAMS Compilers, on the other hand, translate your source code directly into instructions the computer can execute. This is rarely a one-step process because most compilers produce intermediate modules (usually called object code), which must then be linked with standard code that interfaces your program to the computer and to modules you have written previously. This code lets you build up standard libraries of your own modules, which can be a tremendous time-saver because you don't have to rewrite or debug your prewritten and tested code segments. When finished, programs that are compiled run by themselves, and your customer doesn't need either the source code or a copy of the interpreter in order to run them.

THE RATIONALE BEHIND OUR dBASE SPEED TESTS

Differing features on similar products made it difficult to devise a testing strategy.

Testing products such as the dBASE-inspired interpreters and compilers can be difficult because they are similar but not identical. Each product has features and language extensions that can affect execution speed if used. One testing strategy is to optimize each program's throughput by taking advantage of every such feature. The opposite strategy, which we have used, is to maintain source-code consistency to the greatest extent possible.

I programmed two test reports in dBASE II and dBASE III Plus, then attempted to run the exact same programs with the various clones and compilers. I had to make some modifications along the way (see the individual reviews for details), but for the most part I did not use any of the special capabilities offered by each product. The test reports I used, as well as the indexing scenario, are the same as those used for Category 2 and Category 3 product testing in the rest of PC Magazine's Project Database II.

One of the problems in using a programmed report as a timing test is that most programmers could generate the specified reports in several different ways. The methods I chose operate essentially intact on each product. As a result, the figures are reasonably comparable but don't necessarily reflect

maximum performance.

As the test results show, dBASE III Plus's new sorting and indexing routine are certainly fast, but the overall report times are not especially impressive. Clipper was faster than dBASE III Compiler on one report, yet slower on the other. The interpreter timings exhibit similar apparent inconsistencies. Why?

It appears that some internal routines of each product are faster and others slower. When my programs hit a good or a bad routine in any given product, that routine changed the speed for better or worse. It's almost impossible to devise a benchmark test that can forecast program behavior in a variety of circumstances; these report timings are no exception. In general, the compilers are faster than the interpreters; the interpreters differ significantly in performance as well.

If you bear in mind that the predictive ability of these speed tests is limited and that timings with your own code may vary, you should find them useful. Choosing the dBASE-related product that fits your needs involves many factors that we've tried to cover in the individual reviews. Study the reviews that follow and features table on pages 116-118 carefully, and you'll find the dBASE productivity tool that's right for you.

—Glenn Hart

TESTING PROGRAM SPEED

Product	Sort	Index	Report 1	Report 2
Clipper	1:47	0:12	4:48	10:43
dBASE II	1:29	1:02	10:12	13:58
dBASE III Plus	0:14	0:11	8:08	18:51
dBMAN	0:47	0:39	9:00	18:04
dB/Compiler	1:12	0:29	6:43	11:14
dBIII/Compiler	1:15	0:34	6:01	9:11
FoxBASE	0:33	0:22	5:45	12:09

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■ ADDING TO dBASE

There is also a class of products called "pseudocompilers" that translate your code into an intermediate form, which is then executed by a special run-time interpreter. It sounds as though this wouldn't

provide programmers with much of an advantage over a standard interpreter (besides hiding your source code), but the run-time interpreters operate at a lower level than such normal ones as *dBASE* it-

self. As a result, most of them run the intermediate code quite rapidly compared with a normal interpreter.

The primary benefit of using a compiler is execution speed. Compilers analyze your code during the process of compilation, so that the things that slow down interpreters don't affect the execution speed of a finished, compiled program. Loops are much faster; comments and indentation or other spaces within the program have no effect on running time.

The major trade-off is that it will probably take you much longer to create the application if you use a compiler. The only way to test your code is to proceed through the entire compilation-link process, run your program to find any bugs, fix your source using a text editor, and start the whole cycle again. This can be time-consuming and tedious.

RELATED SYSTEMS *dBASE*-related systems are available in all three translation forms. *dBASE II*, *dBASE III Plus*, *FoxBASE*, and *dBMAN* are normal interpreters. Ashton-Tate also offers the *Run-Time* system, which is a rather primitive form of a pseudocompiler meant for professional *dBASE* developers. Nantucket Corp.'s *Clipper* is a true compiler that produces standalone executable programs, while *dB/Compiler* and *dBIII/Compiler* from WordTech compile to an intermediate form called "d-code" that a run-time interpreter executes.

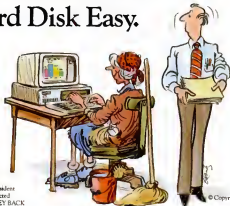
If you develop serious applications in *dBASE*-related languages, perhaps the best combination is both an interpreter and compiler. If you use a combination, however, be careful. Using the language extensions generally offered by the compilers can be problematic because many of those extensions will prevent your code from running with a standard interpreter. If you are careful to restrict yourself to standard *dBASE* statements and functions, you can develop the application with a convenient but slow interpreter and compile it when it's debugged to maximize execution speed.

It's a testimony to both the power and popularity of *dBASE* that such a spectrum of clones and compilers is available. Hopefully, this look at the various contenders will help you decide which set of trade-offs best suits your needs.

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For instance, the chart on the left was created with Graphix Communicator's PrintMerge and GraphicsView. Ram-Resident PrintMerge even prints properly aligned tables made up of any combination of proportional fonts like the table on the right.



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* This is a print image only

You also get full access to all the formatting you've been missing with DisplayWrite 3, Multimate, etc. which include: selection of any font, right justification of any combination of fonts, and a handy line and box drawing function. Plus, keyboard translation screens give you instant access to the LaserJet's foreign language and special purpose characters. Here's a small sample of words you can type without missing a beat!

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Be sure to ask about Polaris Crunch, a program used with Ram-Resident PrintMerge. Polaris Crunch automatically reduces files to sizes the LaserJet can handle. It also rotates and crops graphic images which allows you to print just the amount you want.

Read more about Ram-Resident PrintMerge below.

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■ ADDING TO dBASE

CLIPPER

The Ashton-Tate family of dBASE products are, in the main, interpreters. Just like the BASIC interpreter included with most PCs, the dBASE interpreters examine each line of dBASE code and then execute it—a slow and wasteful process.

True compilers, on the other hand, translate source code directly into the machine language of the computer on which the program will be run. Machine language is highly efficient and fast and has other benefits as well. For one, the resulting programs stand alone and don't need either the interpreter or the original source code to run.

Clipper is a superb compiler that produces executable files from dBASE III source code. Intended primarily for software developers rather than end users, Clipper essentially solves one of the biggest objections to dBASE: execution speed. Clipper is much faster than dBASE in most respects.

One of the beauties of IBM/Microsoft BASIC is its availability in both interpreted and compiled versions. You can develop code with an interpreter, which permits interactive debugging and testing, and then compile for faster execution and to hide the source code from the ultimate purchaser. The situation is similar with dBASE and Clipper. Depending on how you write your code, you can use dBASE for development and compile the finished code for distribution.

dBASE III-CODE COMPATIBLE Clipper is, for the most part, very compatible with dBASE III code. The PC Magazine Labs benchmark programs I wrote for dBASE III Plus ran as written when compiled with Clipper. There are some statements and functions that Clipper doesn't support or that work slightly differently. It doesn't support any interactive commands like CREATE, EDIT, BROWSE, and so forth. Clipper provides separate utilities for several such functions, which are usually not needed in finished applications anyway.

As with most compilers for high-level languages, you prepare a finished application in two steps. After Clipper compiles your code, you must link the resulting ob-

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1985 Sales by Region



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Percent of Sales Increase by State



The map in Figure 2 shows an increase in sales volume in 1985 over 1984. (Growth rate by State is also expected to be the most significant contributor to the company's growth in the near future).

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■ ADDING TO dBASE

ject file using either the standard IBM LINK program or PLINK86, a more sophisticated linker supplied with *Clipper*. PLINK can create overlays to swap sections of code to and from disk and memory to reduce the amount of RAM needed. Unlike some other compiler systems, creating overlays with *Clipper*/PLINK is reasonably painless.

ADDITIONAL FUNCTIONS *Clipper* offers many functions not included with *dBASE III*, including such niceties as arrays, FOR-NEXT loops, user defined multiline functions, command-line parameter parsing, and a programmable help system with screen save and restore. If you use the *Clipper* enhancements, the code won't run under *dBASE*, but if you make judicious use of IF statements, you can include both *Clipper* and *dBASE* methods so that your code can run in either environment.

The newly released Winter '85 version of *Clipper* includes a few functions introduced in *dBASE III Plus*, but it does not support all of the new Ashton-Tate features yet. The most important features not available are network support (reportedly due by the time this review appears) and multiple input/editing screens.

COMPATIBILITY TESTING *Clipper* executed the test reports in 55 to 60 percent of *dBASE III Plus*'s times (see table on page 230). *Clipper*'s sorting and indexing are noticeably slower than *dBASE*'s new routines, and so *Clipper* was penalized by the inclusion of sorts and indexing within the report programs. Modifying the pro-



FACT FILE

Clipper, Winter '85

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List Price: \$695 Requires: 256K RAM,

two disk drives, DOS 2.0 or later.

In Short: A high-powered *dBASE* compiler that is highly recommended for programmers who want to increase the speed of their applications. Copy protected.

CIRCLE 818 ON READER SERVICE CARD

The Only EGA

grams would have resulted in faster execution, but executing the exact same programs as *Plus* was a better test, since that is how *Clipper* will commonly be used. One simple indication of *Clipper*'s speed is that I had to increase the counter used in a delay loop from 75 to over 1,000 to get roughly similar delays.

To test *Clipper*'s compatibility further, I converted a mailing-list package I wrote in *dBASE III Plus*. All I had to do was change all my box-drawing commands to match *Clipper*'s similar, but not identical, syntax and eliminate occurrences of

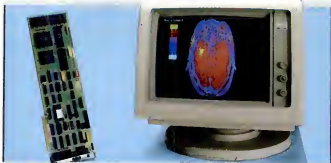
■ *Clipper* essentially solves one of the biggest objections to *dBASE*: execution speed.

dBASE's EDIT command. Both proved to be quite easy. The entire conversion process took only an hour or so, for an application that has nearly 5,000 lines of source code. *Clipper*'s compilation process is fast too; on a 9-MHz AT, it compiled all the code in 6 minutes and PLINK took 90 seconds to link everything.

To put it simply, I am knocked out by *Clipper*. While the *dBASE III Plus* interpretive environment is comfortable and many of the features in the new *dBASE* are powerful, the speed increases you get with *Clipper* are marvelous. In applications that manage very large data files, *Clipper*'s speed can make the difference between sluggish and peppy performance. *Clipper* is reasonably priced and a real tiger. If you develop software or consider yourself a serious *dBASE* programmer, I highly recommend *Clipper*.

dB/COMPILER

dB/Compiler is a compiler designed for *dBASE II* rather than the newer *dBASE III* or *III Plus*. Created by WordTech Systems, whose *dBIII/Compiler* is reviewed on the following pages, *dB/Compiler*



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■ ADDING TO dBASE

doesn't produce native code like *Clipper* does. Your source code is converted to an intermediate form called "d-code" and linked to a library of necessary support routines with a proprietary linker supplied with the package.

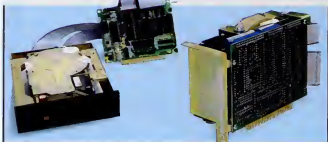
The resulting executable program is actually run by a low-level interpreter. An automatic memory-management scheme optimizes the PC's memory usage without requiring any complicated instructions from you. This gives *db/Compiler* a big advantage over products that need large amounts of RAM in the computer that runs your application or require you to design an overlay structure and wade through the complicated commands usually necessary to implement the structure.

db/Compiler is available for CP/M-86 and CP/M as well as MS-DOS and standard IBM PC-DOS. You can use WordTech crosslinkers to prepare an application on a PC, for example, and link it to run on any of these other operating systems. The 8-bit version of *db/Compiler* has several restrictions and operating differences because of the limited memory available in a 64K environment. The ability to create applications for different systems may be important if you develop commercial software for a variety of target machines.

MANEUVERING AROUND LIMITATIONS

db/Compiler accepts standard dBASE II code with very few restrictions. WordTech takes great pains to point out the differences between *db/Compiler* and dBASE II, but they aren't terribly significant. For example, most interactive dBASE II commands aren't supported, but they're not generally needed in the com-

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FACT FILE

db/Compiler, Version 1.4
WordTech Systems Inc.
P.O. Box 1747; Orinda, CA 94563; (415) 254-0900
List Price: \$750 Required: 192K RAM, two disk drives, DOS 2.0 or later.
In Short: Offers significant speed increases for applications written in standard dBASE II code. Copy protected.

CIRCLE 236 ON READER SERVICE CARD

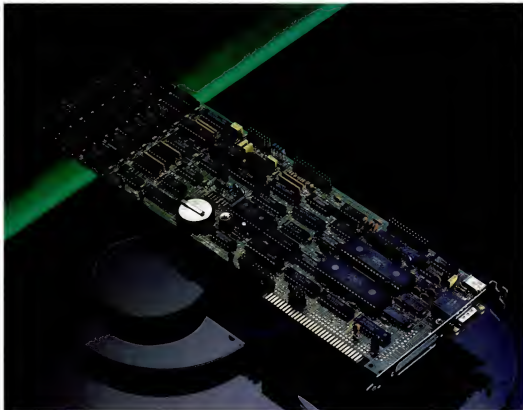
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■ ADDING TO dBASE

piled environment. WordTech supplies detailed suggestions on working around the limitations if you need EDIT, BROWSE, or similar interactive commands. The compiler can't support all forms of macro substitution, but here again, maneuvering around the limitations is relatively easy if you haven't been too carried away with exotic macro manipulation.

dB/Compiler supports multiple-key sorting (with a few restrictions on the na-

dB/Compiler's documentation isn't as polished as the software. It's reasonably well written, especially the sections that explain the developers' philosophy and the problems they faced in designing a compil-

er that accepts code from a language intended for interpretive execution. My copy of the manual was badly printed, with front and back pages scattered around almost randomly, so that following the narrative

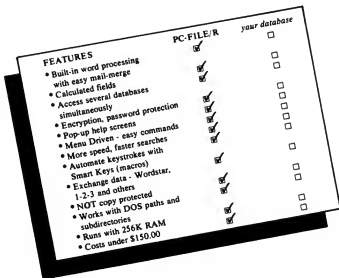
■ *dB/Compiler's* data and index files are completely compatible with those created by *dBASE II*.

ture of the various key fields), which is much more powerful than the single-key limitation in *dBASE II*. You can't specify ascending or descending order on a field-by-field basis, though, as you can in *dBASE III Plus*. The compiler also maintains more precision in numeric calculations, which has obvious benefits but may cause some operational differences from *dBASE II* if you're doing numerical comparisons.

FOLLOW THE LEADER In general, *dB/Compiler* strays very little from standard *dBASE II* syntax. Both data and index files are completely compatible with those created by *dBASE II*. Unlike many *dBASE* clones, there aren't too many significant extensions or new commands or functions. The sample programs I wrote to generate the two Project Database II test reports in *dBASE II* worked with no changes other than modifying SORT to take advantage of the *dB/Compiler* multikey sort capability. Its compilation speed is very good, and the WordTech linker is quite fast. Its execution speed is significantly faster than *dBASE II's*, even when *dBASE II's* DSORT utility was used to speed sorting.

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■ ADDING TO dBASE

was an exercise in increasing frustration. The manual isn't typeset, and several different type elements are used throughout, one of which is nearly unreadable. I understand that a revised manual will be released soon. Incidentally, the copy of *dB/Compiler* I used isn't copy protected, even though the manual says it is.

Since the current *dB/Compiler* release was issued in October of 1984, I have to question WordTech's commitment to the product and whether it is still being developed actively. I can't blame WordTech much if its priorities are focused on its *dBASE III*-compatible compilers. *dBASE* users have responded decisively to the advantages offered by the level-III programs, but many productive applications are still coded in *dBASE II* that would benefit from *dB/Compiler*'s speed increases. If you still do your work in *dBASE II*, and if you've already made a big investment in *dBASE II* programming encrey and expertise, con-

sider *dB/Compiler*—it has plenty of performance advantages to offer you.

dBIII/COMPILER

dBASE III/Compiler is a *dBASE III*-compatible compiler that makes your *dBASE* applications run faster. Like *Clipper*, its main competitor, *dBASE III/Compiler* is easy to use and highly compatible with the original Ashton-Tate product. You don't need *dBASE III* itself to run the finished application, although you'll probably want to have it for program development.

As with other similar systems, you compile your source code and then link in a library of support routines. Both large- and small-memory model libraries are provided. The small model for the PC requires only 128K of free RAM (after DOS and any memory-resident programs are loaded) at runtime, but it allows only 64 fields

in the file definition and either 256 or 128 memory variables in the program (which of these limits applies depends on whether the compiler's FLASH mode is activated to display screens instantly). The large model needs 192K but allows the full 128 fields and 256 memory variables with FLASH active.



FACT FILE

dBII/Compiler, Version 1.2

WordTech Systems Inc.

P.O. Box 1747, Orinda, CA 94563; (415)

25.07.00

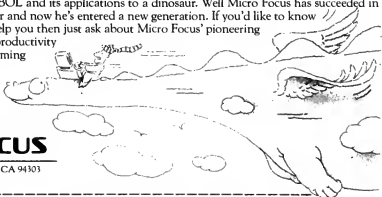
List Price: \$750 Requires: 192K RAM, two floppy disk drives, DOS 2.0 or later.

In Short: Runs most *dBASE III* applications faster, but has a number of incompatibilities. Copy protected.

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PC MAGAZINE ■ JUNE 24, 1986

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■ ADDING TO dBASE

RUNNING APPLICATIONS Most of your applications are likely to run somewhat faster with the small model, but this isn't always the case. Like WordTech's *dB/Compiler*, *dBIII/Compiler* works with generic MS-DOS and video terminals by means of an installation routine. You can adjust other system parameters too, but this usually isn't necessary.

Most of *dBASE III*'s interactive commands are not supported, but some of them are relatively easy to work around if you really need them. More troublesome are differences in how some standard *dBASE III* commands work. *SORT*, for example, doesn't let you specify ascending and de-

scending order on a field-by-field basis as *dBASE III Plus* does, which prevented me from ordering the sample reports as the test scenario specified.

■ *dBIII/Compiler* doesn't come close to *dBASE III Plus*'s lightning-fast sort and index routines.

Some forms of macro substitution are illegal, but this is typical for *dBASE* compilers. Memo fields are not supported. The manual, which is generally well written and nicely produced, indicates that memory variables must be initialized with the *STORE TO* syntax, but the newer "equals sign" method seemed to work both the first time a variable was cited or any time thereafter.

Some forms of macro substitution are illegal, but this is typical for *dBASE* compilers. Memo fields are not supported. The manual, which is generally well written and nicely produced, indicates that memory variables must be initialized with the *STORE TO* syntax, but the newer "equals sign" method seemed to work both the first time a variable was cited or any time thereafter.

NEW LANGUAGE FEATURES *dBIII/Compiler* adds a few new features to the *dBASE* language, although WordTech showed restraint in this area. The most important additions concern machine-level input/output and access to the DOS interrupt system. A new command overrides the sometimes annoying *dBASE* habit of sending form-feeds to the printer when a line number is less than the current one.

dBIII/Compiler includes a really excellent debugging facility, one every programmer will appreciate. You specify a

special library when you link your application and use a long list of special commands to control program flow, examine variable values, list files, and much more. You can also set break points if you wish.

The debugger works smoothly and is immensely useful in developing code.

The test programs I wrote for *dBASE III Plus* required a few changes to run under the *dBIII/Compiler*. After they were made,

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CIRCLE 131 ON READER SERVICE CARD

■ ADDING TO dBASE

the reports ran without incident. Both compilation and linkage were notably fast. Execution time for both reports was significantly faster than that for *dBASE III Plus*. *dBIII/Compiler* doesn't come close to

dBASE III Plus's lightning-fast sort and index routines, so the fact that the overall reports took less time indicates how exceptionally quick the rest of the compiler's functions are.

PSEUDOCOMPILATION STYLE
dBIII/Compiler's style of compilation has sometimes been called "pseudocompilation" because the final output isn't directly executable native code and requires a low-level interpreter to run. This same technique was used by the ill-fated UCSD Pascal compiler (*dBIII's* "d-code" is analogous to UCSD's p-code), and perhaps some of the onus has rubbed off on *dBIII*.

This method of compilation is not as fast as native code, but it has advantages—primarily the ability to manage memory automatically so that your applications can run on machines with much less RAM installed. Applications compiled with *dBIII/Compiler* require less memory than the same applications developed under *Clipper*. Both data and index files that are created and manipulated using *dBIII/Compiler* are completely interchangeable with standard *dBASE III* files, a real convenience if you use both environments during development.

In the on-going battle between WordTech's *dBIII/Compiler* and Nantucket's *Clipper*, *Clipper* seems to have the upper hand at the moment. But WordTech will have a native code compiler out this summer that could give *Clipper* a real run for the money.

dBMAN

dBASE has spawned several offshoots that claim to address the leading database manager's weaknesses in one area or another. For the most part, *dBASE's* execution speed has been the primary target, but VersaSoft's *dBMAN* takes a different approach. It too is an interpreter, and so it doesn't offer any earthshaking speed advantage. Instead, *dBMAN* attacks *dBASE* on programmer productivity and local area network support. *dBMAN* attempts to walk a tightrope between *dBASE* compatibility and enhanced and new functions that improve the programming language.

dBMAN claims to be "92 percent syntax-compatible with *dBASE II* and *III*." I'm not sure how one calculates such a number, but *dBMAN* can digest most of your *dBASE II* code reasonably whole and does moderately well on some *dBASE III*

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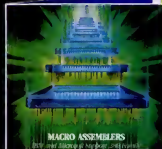
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■ ADDING TO dBASE

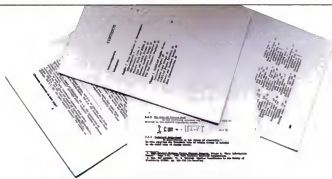
code. As usual, the amount of modification you must perform to get a ported *dBASE* application to run depends on how you wrote the original code. The Project Database II test reports I programmed for

dBASE III Plus required several hours of diddling to run under *dBMAN*, and even then they did not work identically. I had to change some of the basic algorithms and apply various programming tricks to ob-

tain the desired results.

Porting existing *dBASE* applications to *dBMAN* is not the real point, though. *dBMAN*'s strengths appear when you use its enhancements, new commands, and functions for original program development. The list of improvements is extensive. Some add features to existing *dBASE* commands, like descending indexing, multiple parent-child relationships of up to ten files at once, using EXIT from a variable number of levels from within DO loops, execution of a program when a GET is issued for improved entry validation, access to the variables in ten open files without SELECTs, indexing a subset of a large data file separately to improve access speed, and so on. *dBMAN* includes a comprehensive set of machine-code commands and a long list of extra functions for such things as trig calculations, string manipulations, window and frame management, horizontal and vertical menu generation, Soundex codes, conversion of numbers to English words for checks, and more. Its excellent debugging facilities are helpful during program development. Its powerful security system controls read and write access down to the individual field level and encrypts structures and data and index files.

GOOD USER INTERFACE *dBMAN* was the first *dBASE*-type program to support local area networks (Novell Advanced Network and IBM PC networks). Sophisticated techniques implement both file- and record-locking to prevent data file and index corruption during multiuser access to common data.



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(408) 268-6033

List Price: \$395 **Requires:** 256K RAM,
one floppy disk drive, DOS 2.0 or later.

In Short: *dBMAN* can be a strong enhancement for advanced *dBASE II* programmers, but owners of *dBASE III Plus* may not find it helpful enough. Not copy protected.

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dbMAN's user interface is much better than *dbASE II*'s, although not quite as good as that of the new *dbASE III Plus*. Two windows are displayed, one for your input, error messages, and the like and the other for output. You must type commands in full (no four-letter abbreviations like *dbASE*), but a series of control-character sequences improve your control over the program.

I had some problems with the tutorial. The screen doesn't always match the manual, not all the commands work as described, and not all the sample files needed were provided. There were minor bugs in some of the demo program files. The documentation itself also needs a major revision. As it is, you must wade through several revision notices to figure out what has been added and changed. I examined a draft of a completely new manual that is greatly improved, and it should be available by the time this review appears.

In PC Magazine Labs' tests, *dbMAN*'s sort, index, and retrieval routines were much slower than the very fast *dbASE III Plus* equivalents, although the total report times were similar. The report algorithms were not identical, though, and some of *dbMAN*'s individual functions were notably quick.

APPEALING BUT LIMITED It is somewhat difficult to judge the merits of a product like *dbMAN*. It has several appealing extensions to the standard *dbASE* language, but it lacks many or most of the attractive features in the newest Ashton-Tate offering. *dbMAN*'s network support is much less significant now that *III Plus* supports networks too, even though *dbMAN*'s network methods are clearly superior. *dbMAN* does cost about 40 percent less than *III Plus*.

dbMAN has merit, especially for more-advanced *dbASE* programmers, but I'm not sure it offers sufficient benefits to most users to justify stepping outside the mainstream of the *dbASE* world. It isn't as compatible as it claims, and it doesn't offer the speed advantage over *dbASE* that compilers like *Clipper* provide. I don't mean to damn with faint praise, but *dbMAN* is a good product at a good price. I just don't know whether that's enough, considering the alternatives.

FOXBASE

FoxBASE from Fox Software Inc. is a derivative of *dbASE II*, Ashton-Tate's original member of the *dbASE* interpreter fam-

ily. Most *dbASE* clones have converted to *dbASE III* or even *dbASE III Plus* syntax, and Fox Software will be releasing such a product this summer too. In the meantime, the current release of *FoxBASE* has much



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■ ADDING TO dBASE

to commend it.

Fox claims that compared with *dBASE II*, *FoxBASE* generally runs 3 to 5 times faster, sorts up to 20 times faster, and writes to the screen 23 to 27 times faster. It supports up to 48 fields per record versus *dBASE II*'s 32 (neither figure is particularly impressive, though, when compared with *dBASE III*'s figures). Its indexes use advanced B-tree techniques and are 50 percent smaller than *dBASE II*'s. As a result, they aren't compatible with normal *dBASE* indexes (although its DBF data files are identical). A big advantage to software developers is that *FoxBASE* is available under a wide variety of operating systems, including DOS, MultiLink Advanced, IBM PC Network, Novell networks, XENIX, and UNIX. The multuser versions of *FoxBASE* feature automatic record-locking and optional file-locking, which Fox claims "largely eliminate any need for substantial program revisions to take full advantage of multiuser capabilities." Runtime versions of *FoxBASE* are available so that you can commercially distribute your applications without providing source code to customers.

FoxBASE is not copy protected and requires no installation. PC Labs examined both single-user and multiuser versions. Even the single-user release recognizes (and ignores) any multiuser commands you include, and so you can develop programs in either environment. The multiuser version requires DOS 3.1, and you must run the SHARE command before you load *FoxBASE*, a fact buried deep within the otherwise fine documentation. Details for the various operating systems



FACT FILE

FoxBASE, Version 2.17D

Fox Software Inc.
27475 Holiday Lane; Perrysburg, OH
43551; (419) 874-0162

List Price: \$395 **Requires:** 256K RAM,
one floppy disk drive, DOS 2.0 or later.
In Short: A fine, smooth *dBASE II* clone that
excels in the multiuser environment and is
very good in the single-user environment as
well. Not copy protected.

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supported are included in the manual, which is a sort of Rosetta stone for advanced users but might be confusing to some others.

COMMAND SYNTAX The command syntax is very much standard *dBASE II*; it uses only a few meaningful command and function extensions (far fewer than do

■ The reports I had programmed for *dBASE III* didn't require much modification to run in *FoxBASE*.

products like *dBMAN*) for maximum compatibility. The primary difference is the set of commands that control multiuser access. The small number of multiuser commands is deceptive, since *FoxBASE*'s multiuser methodology is actually quite sophisticated. While you can assert control over file- and record-locking if you wish, *FoxBASE* is capable of handling record-locking automatically without your intervention. File-locking is easy to implement for global updates or appending records. In general, you will not need to make very many, if any, modifications to normal single-user *FoxBASE* programs.

Programming the PC Labs test reports was a bit like stepping backward in time. I hadn't used *dBASE II* in quite some time, but the old conventions bubbled to the surface quickly. *dBASE III Plus* certainly offers many conveniences and useful features, but the reports I had programmed for *dBASE III* didn't really require all that much modification to run in the *FoxBASE/dBASE II* syntax. The main distinction was having to program searches in multiple files without the SET RELATION TO command; I imagine the *FoxBASE* commands I programmed do essentially what SET RELATION does anyway. The only aspect of the assigned reports I couldn't work around was the single-key sort. In the old days I used to write



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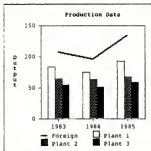
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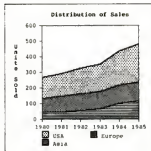


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■ ADDING TO dBASE

my data files out to ASCII and use Micro-Pro's *SuperSort* utility (now I would probably use the excellent Opt-Tech *Sort* instead or, even better, Ashton-Tate's *DSort* to sort the data file directly) to perform multikey sorts, and this technique would have worked here as well. No such sort utility is included with *FoxBASE*; you would have to buy the external sort program separately if your application required either multikey or higher-speed sorts.

SPEEDY CLONE *FoxBASE* was almost twice as fast as *dBASE II* on the first PC Magazine Labs test report but showed a lesser advantage in the second report.

■ *FoxBASE* is a fine *dBASE II* clone. Its main claim to fame is clearly its multiuser functions, but it's very good even in a single-user environment.

Some of *FoxBASE*'s functions are noticeably faster than *dBASE II*'s, while others are not. It will be interesting to see how the upcoming *dBASE III Plus*-type version will compare with the current Ashton-Tate product.

FoxBASE is a fine *dBASE II* clone. Its main claim to fame is clearly its multiuser functions, but it's very good even in a single-user environment. Like *dBMAN*, *FoxBASE* beat Ashton-Tate to the punch in multiuser support. Now that *dBASE III Plus* offers multiuser support, *FoxBASE*'s appeal may diminish somewhat, even though *FoxBASE* makes conversion to the multiuser environment easier than *dBASE* does. The *dBASE III Plus*-compatible *FoxBASE+* release should be worth your attention, but I am impressed with the smoothness and the features of the current *FoxBASE*.

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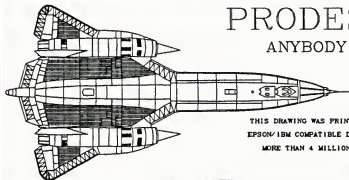
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KEYBOARD MACROS AND REDEFINITION



Manipulating your keyboard can work wonders: single keys can be changed to hold long strings of data. You can do the programming yourself or buy the work of a pro.

Keyboard macros, which can turn a single keystroke into a whole series of commands or a string of data, put more power at your fingertips than DOS or your applications programs can normally provide. Although most users buy commercial programs (see sidebars, "Keyboard Macro Programs," and "What Keyboard Macros Do") that create such keystroke savers, you can also roll your own keyboard macros and redefine your keyboard using no more than the programs that come with DOS.

To explain how keyboard macro programs work, I'll take you on a little tour of the BIOS and DOS routines that handle the keyboard. We'll see how your keystrokes are stored in memory and how programs read information from the keyboard. After these preliminaries, we'll look at some of the methods for redefining the keyboard that are built into DOS, and we'll also write some of our own programs.

THE JOURNEY OF A KEYSTROKE

Every keystroke you type travels a long and circuitous route to get from the hardware into the program you're running. Let's start at the beginning with the hardware.

When you press a key on the keyboard, the keyboard hardware sends an interrupt signal to the microprocessor. The Keyboard Interrupt is called IRQ1, and it normally has the second highest priority of all the PC hardware interrupts. (The highest priority interrupt is IRQ0, which is the clock timer. Some of the other hardware interrupts are used by the serial ports, the

parallel port, and the disks on your system.)

The PC's interrupt controller (an Intel 8259 chip) translates IRQ1 into Interrupt 9. When the microprocessor receives a hardware interrupt, it stops what it's doing and jumps to the interrupt service routine. For Interrupt 9, this routine is located at address 0000:0024 (hexadecimal). If you boot up "clean" (that is, without any resident programs in your AUTOEXEC.BAT file), this address points to a routine in the ROM BIOS.

The BIOS Interrupt 9 routine reads the scan code of the key from the hardware. For the most part, keyboard scan codes are numbered sequentially from left to right, beginning at the top row of the keyboard. (Exceptions include the function keys and cursor keys.) The BIOS Interrupt 9 routine is responsible for converting the scan code into an ASCII code, maintaining shift state information, pausing on Ctrl-NumLock,

executing an Interrupt 5 (Print Screen) when it detects a Shift-PrtSc, and rebooting on Ctrl-Alt-Del. The assembly language code for Interrupt 9 (including the several tables it uses) takes up about nine pages in the listing of the BIOS contained in the PC *Technical Reference* manual.

After decoding the keystroke, the Interrupt 9 routine stores both the scan code and the ASCII code in a circular buffer located in the BIOS "data area" in segment 40h. The buffer is 16 "words" (32 bytes) long and can hold 15 keystrokes, each keystroke requiring 2 bytes. The BIOS uses 4 other words in the BIOS data area for maintaining this buffer. Two words contain the starting and ending address of the buffer itself. Two other words hold the address at which the next typed keystroke is to be stored, and the address from which the next keystroke is to be retrieved from the buffer. By using this circular buffer, the BIOS allows you to type up to 15 characters ahead of what your program has pulled from the buffer.

If the keystroke is a "shift" key (these include Ctrl and Alt, as well as the Left and Right Shift keys) or a toggle key (CapsLock, NumLock, and ScrollLock), the Interrupt 9 routine does not store the key in the buffer but instead adjusts two other bytes in lower memory to reflect the current shift states. If the key you have pressed has no ASCII value (which it won't if it's a function key or a cursor key), the ASCII code stored in the buffer will be 0, and the scan code registered will be either an actual scan code (if the key was struck without shifts) or an extended key

■ To explain how keyboard macro programs work, I'll take you on a tour of the BIOS and DOS routines that handle the keyboard.

■ PC LAB NOTES

code. If the BIOS Interrupt 9 routine detects a keystroke that is not defined (such as the number-pad 5 key when NumLock is off), it simply ignores it.

The 2-byte keystroke code will stay in this buffer until some other program removes it. So, let's leave the keystroke sitting there and look at how programs read keystrokes.

READING THE KEYBOARD If you program in BASIC or another high-level language, you probably use statements such as INPUT or INKEY for reading the keyboard, without worrying much about how the program gets the actual keystrokes. Assembly language programmers, however, know about several ways to read the keyboard. The easiest way is to use one of the several DOS function calls for keyboard input that are documented in the DOS *Technical Reference* manual.

When DOS receives a request to read the keyboard through one of the DOS function calls, it usually calls a routine in the CON device driver. (CON stands for "console" and refers to the keyboard and display.) The CON device driver is loaded automatically when DOS is booted.

I said that DOS "usually" calls a routine in the CON device driver. If you've executed a command on the DOS command level that uses redirection of standard input (to get input from a file, for example), DOS will not call a routine in CON but will instead call a routine in the device driver that accesses your disk. Similarly, if you've executed the CTTY command to use a terminal connected to a serial port as your console, DOS will instead call a routine in the AUX device driver.

Under normal conditions, however, DOS calls the CON device driver, and the CON device driver calls the Interrupt 16h routine in the ROM BIOS. The code for BIOS Interrupt 16h is very short—a single line of assembly language code in the PC *Technical Reference* manual. Its main functions are to retrieve the keystroke from the buffer (where it's been since Interrupt 9h put it there) and to return it to the calling program. All the real work has already been done by Interrupt 9h.

The BIOS Interrupt 16h returns 2 bytes, one for the ASCII code and one for the scan code. If the keystroke is a non-ASCII

KEYBOARD MACRO PROGRAMS

Capturing and redefining keys can be more than just a convenience. Adding sophisticated programs that manipulate your keystrokes before they get passed along to an application—or even DOS—can add a new dimension to the powers of your PC.

The concept of keystroke capturing and redefinition has been expanded by commercial applications termed "keystroke [or keyboard] macros." Instead of substituting one key for another, these programs continuously monitor Interrupt 9h. When they detect a certain predefined keystroke or series of keystrokes, they switch into a special "playback" mode that automatically pours forth a predefined string of responses up to thousands of characters long.

Such keystroke preprocessing can give your PC batch capabilities that mimic the workings of many mainframe computers. While ordinary DOS batch files merely start applications running, keyboard macro programs can control applications as they run.

All of today's commercially available keyboard enhancers feature windowlike menus that pop up within other applications to let you define or change macros. Additionally, you can keep libraries of keystroke definitions in disk files to be loaded as needed.

BUFFER, SCREEN BLANKER Most of the keystroke macro programs add other features, too. Many extend the PC's standard type-ahead buffer from 15 characters to 128. Most include screen-blanking routines that darken your monitor to save its phosphors if you don't use the keyboard for several minutes. A few allow you to cut pieces of text from the screen to assign it to a key, allowing you to move text and data from one application to another.

PROKEY: THE STANDARD The pioneering keyboard enhancement program for the PC was *ProKey*, now in its fourth

major revision. The \$129.95 program is probably the most-tested and most-used PC keyboard enhancement program available, and its abilities set the standard by which all others are judged.

With *ProKey* 4.0 you can create up to 300 macros using a total of 30,000 characters, or, to conserve memory, you can limit the maximum number of keystrokes it keeps on-line. Plain-looking, text-only menus allow you to view a list of the macros you've defined at any time, even within an application. You can edit and add definitions or even change a complete library from within applications. One macro can call another macro.

Along with the main program and its loader you get a keyboard layout program (to relocate a badly placed Backslash key or to invoke a Dvorak keyboard), built-in screen blanking, and a manual that is a model of clear and concise writing. Unlike some earlier versions, *ProKey* 4.0 is not copy protected and remains completely RAM resident.

NEWKEY: RUDIMENTARY AND CHEAP Although somewhat more rudimentary than *ProKey*, *NewKey* offers many of the same features, including the ability to store up to 32,000 characters for playback or specify a memory-saving lower limit. Born as shareware, with demonstration copies of an earlier version (2.4) still available on some bulletin boards, the latest version of *NewKey* (Version 3.0) must be purchased, but at the budget price of \$29.95.

As with *ProKey*, *NewKey* lets you define and edit macros from within applications. A display of your key translations, macros, and *NewKey*'s cut-and-paste abilities are also just a keystroke away. More-advanced functions require running a special support program.

BORLAND'S SUPERKEY The most publicized keyboard enhancement program today must be Borland's *SuperKey*. This \$69.95 program starts out with *Pro-*

Key's keyboard-enhancing functions, then adds a host of related and tangentially related features. *SuperKey* lets you encrypt files to keep them safe from prying eyes. You can cut text already on the screen and paste it into a macro so that you can easily transport it between applications.

SuperKey can buffer DOS commands for later recall, blank your screen, and allow nested macros. Should you want to use your macros to assist less-experienced users, *SuperKey* also permits you to create help macros and display full screens of text. The whole set of functions is loosely organized through a pull-down menu system.

KEYWORKS, SMARTKEY *Keyworks* and *SmartKey* pack features that push them beyond even *SuperKey*. Starting with all the standard *ProKey* features, they add many of the features of *SuperKey*. Like *SuperKey*, both programs let you cut and paste. Both let you build menus or windows to aid inexperienced users. Both include file encryption capabilities—*Keyworks* as an internal function and *SmartKey* as a separate program. Both include keystroke recall so that you can create macros after you've typed them. *SmartKey* remembers the last 64 characters you've typed; *Keyworks*, the last 300.

Beyond *SuperKey*, *Keyworks* and *SmartKey* let you send commands directly to your printer so that you can change character pitches or type fonts on the fly from the middle of application programs. Both let you call several standard DOS functions from within other applications.

SmartKey makes two normal keys serve special functions as the *SmartKey* and the *SuperShift* key. A press of the *SmartKey* calls the program into the foreground and steps you through its functions. The *SuperShift* key acts like another Shift key (in addition to Ctrl- and Alt-) and allows you to double the key combinations that can call your macros. The latest version (5.1) of *SmartKey* adds a mnemonic mode that lets you call up boilerplate paragraphs by merely typing a short keyword without pressing a spe-

cial Shift (or even *Smart*) key. (Although this is new to *SmartKey*, other programs like *ProKey* have the same ability.)

Some of the *Keyworks* functions go even further than those of *SmartKey*. For instance, you can cut and paste screen text not just to a macro but to a file or a printer. Its embedded DOS functions include creating and removing directories.

For my taste *Keyworks* is somewhat better integrated than *SmartKey* and has a more professional look (*Keyworks* uses vertical bar menus to choose functions from within applications while *SmartKey* uses 1-2-3-like horizontal bar menus), but *SmartKey* is hands down the better buy—for \$59.95 you get some extra conveniences (like mnemonics), which \$89.95 *Keyworks* lacks.

Which of these programs is best for you depends on what you want from a keyboard enhancer. If you bought an IBM PC for the security and assurance that the Big Blue label seems to guarantee, you'll probably feel safest with *ProKey*. If you just want to try out macros without making a major investment, *NewKey* is the best introduction and just may be all the program you need. For a cornucopia of power at a pleasing price, however, try *Keyworks* or *SuperKey*.

PRD+: SHORTHAND ON A PC If your primary use of a macro program is to turn abbreviations into longer phrases, *PRD+* is worth a look. As you type, it cross-checks input against predefined phrase lists. If you key in "plscil," *PRD+* replaces it with "please do not hesitate to call me at." It also can be used with databases or spreadsheets to enter repetitive data (see *PC Magazine*, Volume 5 Number 8, page 56). *PRD+* will often do keystroke entry faster than the same number of keystrokes entered via a macro program.

Expect to see competitors to *PRD+* emerge shortly. One already out is *RapidWriter*, a software-hardware combination that includes a replacement keyboard. —Winn L. Rosch

Winn L. Rosch is a contributing editor of *PC Magazine*.

extended key, the ASCII code will be 0. For ASCII keys, the CON device driver simply ignores the scan code and returns the ASCII code to DOS, which then passes it on to the program that made the DOS call. For extended keys, the CON device driver returns a 0 and saves the extended keyboard code. It returns the scan code when it is called a second time. Thus, reading extended keys through DOS requires calling DOS twice.

GOING STRAIGHT TO THE BIOS

Many large applications programs (such as spreadsheets and word processors) don't use DOS to read the keyboard; instead, they bypass DOS and use the BIOS Interrupt 16h directly.

Why is this? There are several reasons. For one thing, Interrupt 16h can return shift information and DOS cannot. Many large programs display shift information on the screen; if they use the BIOS to get this information, they might as well use the BIOS to get other keyboard information as well. Again, for reading function keys and cursor keys, using the BIOS is somewhat easier because it requires only one call instead of two.

Again, some programs need to distinguish between the Plus and Minus keys on the upper row of the keyboard and the Plus and Minus keys to the right of the cursor pad. Using DOS calls to get keyboard information makes this distinction impossible, since the CON device driver returns the same ASCII Plus and Minus codes for both pairs of keys. The BIOS Interrupt 16h, however, returns unique scan codes for these two sets of keys, so programs can treat them differently, if desired.

STEALING INTERRUPT 9 Some programs use the keyboard on a more fundamental level by redirecting the hardware keyboard interrupt (Interrupt 9) and intercepting keystrokes themselves. There are certainly some advantages to doing this. First, the program gets keyboard information faster, since it doesn't have to keep checking if a keystroke has been typed. Second, as we have seen above, Interrupt 9 ignores keystrokes that are not defined, so programs can use undefined keystrokes (such as Alt-Tab) for their own purposes. Some programs use their own Interrupt

■ PC LAB NOTES

9 handlers to supplement the one in the BIOS and just add their own decoded keystrokes to the normal buffer that the BIOS maintains. They can then read the keystrokes through Interrupt 16h. Other programs take over Interrupt 9 completely. The most notorious of these latter programs (at least around the *PC Magazine* offices) is *XyWrite II Plus*.

Many pop-up resident programs intercept Interrupt 9 and check each keystroke that you type. If your keystroke is anything but the special key that has been defined to trigger the pop-up, the program simply lets the regular BIOS Interrupt 9 process the key. The keyboard hardware of the PC is quite amenable to this procedure, since a program can read a key through an input port without actually removing it from the hardware. Thus, the Interrupt 9 routine can still process the key even though another program has already taken a look at it.

THE WHOLE PICTURE Now that you've seen how keyboard information gets from the hardware into a program, you can see that there are several places where a resident program could insert itself for the purpose of changing one key into another or for defining a whole string of characters to be triggered by a single keystroke. The choice of where to insert the keyboard redefinition routine will depend on which programs are to be affected by the redefined keys. For instance, if we use a high-level keyboard redefiner that works at the DOS level, programs that use the BIOS for getting keystrokes will not be affected by it.

Indeed, the fact that many applications programs bypass DOS can be an advantage, for it means that we can define function keys for use at the DOS command level without having to worry that they'll maintain those functions within an applications program. (For example, if we define F10 to be DIR, we don't want it to operate this way in *I-2-3*, where it would replace the Graph function.)

So, let's start at this high level by entirely replacing the CON device driver that DOS uses with something that lets us redefine the keyboard. This is really not as difficult as it may sound, because such a replacement for CON has been included with PC-DOS since Version 2.0.

WHAT KEYBOARD MACROS DO

What are the uses of keyboard macros? You can redefine a seldom-used key, for instance, Alt-S (for signature) to type "Very truly yours" and your name into a business letter with one keystroke rather than several dozen. In Lotus's *I-2-3*, you could use Ctrl-M to enter the 12 months in a spreadsheet row.

You could use any key on the keyboard, but normally you wouldn't want to redefine the alphabet or number keys. More likely choices are the Ctrl, Alt, and function keys, alone or shifted.

So you don't have a communications program that logs you onto an electronic mail service? With \$35 *PC-TALK III*, *ProKey* (or any of their competitors), and a batch file, the PC could do almost all your work for you. For example, you could create MCI.BAT:

```
rem CALLING MCI MAIL
pkload
prokey modem.pro/r[altl]
```

Typing MCI <Enter> runs the batch file that loads *ProKey* (pkload). The next line reads in (/r) a file (modem.pro) that tells the PC which keys have been redefined and then runs the keystrokes linked to Alt-1, a key combination chosen be-

cause it isn't used by *PC-TALK III*.

Alt-1 starts *PC-TALK III*, then goes to the dialing menu and dials the number for the local MCI Mail service. In *ProKey*, however, you don't have two-way communication between *ProKey* and your PC, hence you, not *ProKey*, have to determine when you've made a connection and finish the log-on sequence (hitting the Enter key and typing in your password).

Another example, suggested by Rose-Soft, is to type an envelope on a printer. By placing the cursor in the address area of a letter and hitting Alt-E (for envelope), your word processor (via the keyboard macro program) can search for the double carriage returns before and after the address area, mark that as a block, write the block to a separate file, and tell the program to print the separate file. All you have to do is have an envelope waiting in the printer.

Some programs have macros built in or let you redefine keys. For instance, *I-2-3* has its own macros that handle conditional branching and make decisions that a standalone macro utility couldn't, but *I-2-3* macros are a good deal harder to learn.—Bill Howard

THE BASICS OF ANSISYS The ANSISYS device driver included with PC-DOS 2.0 (and later) can redefine keystrokes for programs that use DOS to obtain keyboard information. Normally, as we've seen above, DOS uses the CON device driver to obtain keystrokes, and the CON device driver uses the BIOS Interrupt 16h. The CON device driver is also used by DOS for console output, which is the video display.

ANSISYS replaces the normal CON device driver with one that provides "extended screen and keyboard control" (as the DOS manual puts it). ANSISYS implements a subset of American National Standards Institute (ANSI) document X3.64-1979, which is entitled, "American National Standard Additional Controls for Use with American National Standard

Code for Information Interchange." The acronym ASCII is derived from this. Essentially, the X3.64-1979 standard defines the control sequences that allow programs to control a video display (e.g., position the cursor or set high intensity) in addition to just writing to it.

The keyboard redefinition facilities of the DOS ANSISYS program are not themselves part of the ANSI standard. Look on them as an extra little gift.

To use ANSISYS, you need to have a file called CONFIG.SYS in the root directory of the disk drive you boot from. If you don't have a CONFIG.SYS file, you can create one with EDLIN or any other ASCII text editor. This CONFIG.SYS file should contain the line

DEVICE=ANSI.SYS

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Quixote Corp.
1 E. Wacker Dr.
Chicago, IL 60601
(800) 523-8356
(800) 325-1850 (in Ill.)
(312) 467-6755
List Price: \$395

Requires: 64K RAM beyond other applications.

In Short: Text and command substitution program and modified Keytronic keyboard for PC and PC-XT. Not copy protected.

CIRCLE 634 ON READER SERVICE CARD

Keywords, Version 2.0

Alpha Software Corp.
30 B Street
Burlington, MA 01803
(617) 229-2924

List Price: \$89.95, upgrade, \$19.95
Requires: 64K RAM.

In Short: A full-featured keyboard enhancer with complete macro capabilities, pop-up menus, file encryption, ability to make menus, and ability to execute DOS commands from within applications. Not copy protected.

CIRCLE 635 ON READER SERVICE CARD

SuperKey, Version 1.15A

Borland International
4585 Scotts Valley Dr.
Scotts Valley, CA 95066
(408) 438-8400

List Price: \$69.95; update, \$15
Requires: 51K RAM in default configuration.

In Short: A keyboard enhancer with pull-down menus and editing on the fly, file encryption, and help window-making abilities as well as instant recall of the last 10 to 30 DOS commands. Not copy protected.

CIRCLE 636 ON READER SERVICE CARD

SmartKey, Version 5.1

Software Research Technologies
3757 Wilshire Blvd., #211
Los Angeles, CA 90010
(800) 824-5537
(213) 384-5430

List Price: \$59.95
Requires: 21K RAM minimum
(30K RAM in default configuration).

In Short: A keyboard enhancer with full macro capabilities, pop-up horizontal bar menus, file encryption, definable SmartKey and SuperShift, ability to make menus, and ability to perform several DOS functions from within applications. Not copy protected.

CIRCLE 637 ON READER SERVICE CARD

ProKey, Version 4.0

RoseSoft
P.O. Box 45880
Seattle, WA 98105
(206) 282-0454

List Price: \$129.95
Requires: Default configuration
42K RAM.

In Short: The standard among keyboard enhancers. Includes new Layout program, pop-up menu, and macro editing on the fly. No longer copy protected.

CIRCLE 638 ON READER SERVICE CARD

NewKey, Version 3.0

FAB Software
P.O. Box 336
Wayland, MA 01778
(617) 358-6357

List Price: \$29.95
Requires: Default configuration
86K RAM; DOS 2.0 or later.

In Short: An updated shareware program that now has an inexpensive keyboard enhancer with full macro support and macro editing on the fly. Not copy protected.

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Requires: 64K RAM, DOS 2.0 or later.

In Short: A fast, memory-resident shorthand program that turns abbreviations into words or phrases. Works with data bases, spreadsheets as well as word processing programs. Not copy protected.

CIRCLE 640 ON READER SERVICE CARD

and the DOS file called ANSI.SYS should also be in your root directory. If you boot from a hard disk and your DOS files are in a subdirectory called DOS (for instance), you can alternatively use the line

DEVICE=DOS\ANSI.SYS

However, CONFIG.SYS must still be in your root directory.

Neither ANSI.SYS nor CONFIG.SYS should be part of your AUTOEXEC.BAT file. CONFIG.SYS works similarly to an AUTOEXEC.BAT file, except that CONFIG.SYS contains device drivers and other information that DOS needs while it is loading, while an AUTOEXEC.BAT file contains programs that will be run immediately after DOS has loaded.

In his *Programmer's Guide to the IBM PC*, Peter Norton reports that some non-PC-compatible MS-DOS machines, including the TI Professional and the NEC

Advanced Professional Computer III, have ANSI.SYS already built into their versions of MS-DOS. For such machines, ANSI.SYS does not have to be explicitly loaded.)

Once you create the CONFIG.SYS file, you can reboot and ANSI.SYS will be loaded automatically.

USING ANSYSYS To redefine a keystroke or create a keyboard macro using ANSI.SYS, you have to send an ANSI control sequence to the display through DOS. The ANSI.SYS device driver intercepts this control sequence and stores the keyboard redefinition. The control sequence looks like this

<Esc>[#: #p

to turn one key into another key or

<Esc>[#: "string"

to turn a key into a string.

In the above listing, the symbol <Esc> means the ASCII "Escape" code (which is also defined as Ctrl-[or hex 1Bh); the first # is the decimal ASCII code of the keystroke you want to redefine, and the second # or "string" is what you're defining it to. The "p" at the end tells ANSI.SYS this is a keyboard redefinition. If you're redefining an extended key, the ANSI control sequence starts off as

<Esc>[0: #;

where # is the extended key number.

The extended key numbers are defined in the PC *Technical Reference manual*. For the ten function keys, the numbers are 59 through 68. The Shift-function keys are 84 through 93, Ctrl-function keys are 94 through 103, and Alt-function keys are 104 through 113.

The toughest part of using ANSI con-

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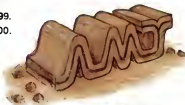
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control sequences is the Escape code right at the beginning. If you try entering an Escape in EDLIN, you'll cancel the line you're typing in. Many word processors also use the Esc key for special purposes.

Naturally, there are ways around this problem. In EDLIN, you can enter an Escape code by typing Ctrl-V followed by the left bracket. It will look like `[` when you first type it in and `[` if you later list the line. In *WordStar's* nondocument mode, you can insert an Escape code by typing Ctrl-P and Ctrl-`[`. This will show up on the screen as `[`. (Don't forget that you must then also type another left bracket following this Escape code.) In *Microsoft Word*, you can enter an Escape character by holding down the Alt key, typing 27 on the number pad, and releasing Alt. It will show up as a left arrow. (Don't forget to save the document unformatted.)

Now let's create a batch file to help us redefine function keys. This batch file, `ANSISET.BAT`, has just one line

```
REM <ESC>[0;11;"%2 %3 %4 %5";13p
```

where `<Esc>` is the ASCII Escape code that you will enter in whatever way is suitable for your editor. The `%1` through `%5` are replaceable parameters when you execute the `ANSISET` batch file. The 13 is the ASCII code for a carriage return.

Have you ever seen a batch file that contains just a `REM` statement? I used `REM` here to illustrate an important point: all you have to do is send the ANSI control sequence to the screen for display in order to redefine a key. When you run `ANSISET`, only the word `REM` will be shown. (If you see a left arrow followed by the rest of the control sequence on your screen, then `ANSI.SYS` has not been installed.)

To redefine the F10 key to mean DIR followed by a carriage return, for example, you enter

```
ANSISET 68 DIR
```

The actual ANSI control sequence that the batch file will create is

```
<Esc>[0;68;"DIR " ;13p
```

The three spaces after the DIR look wasteful, but they are necessary to allow `ANSISET` to use up to five parameters on the command line. For instance, you may want to define Alt-F1 to be a "backup"

key to copy all files in a certain subdirectory to a disk. You could do it with

```
ANSISET 104 COPY *.* B: /V
```

In this case, the `%3` in the batch file gets replaced by `*.*`, `%4` is replaced by `B:`, and the `%5` is replaced by `/V` (for verify). The resulting ANSI sequence is

```
<ESC>[0;104;"COPY *.* B: /V";13p
```

Although the `ANSISET` batch file is most useful for function keys, you can also redefine cursor keys. For instance, you may want to define Ctrl-Home to mean clear the screen (the way it works in `BASIC`). For that, you'd execute

```
ANSISET 119 CLS
```

If you want to set up some ANSI se-

■ The toughest part of using ANSI control sequences is the Escape code at the beginning.

quences that do not end with a carriage return, use another batch file without the final semicolon and 13, like this:

```
REM <ESC>[0;11;"%2 %3 %4 %5"p
```

Eventually, you may want to include a bunch of explicit keyboard definitions in an `AUTOEXEC.BAT` file. If you normally run your `AUTOEXEC` with `Echo` turned off, use an `ECHO` command instead of `REM`. The statements in your `AUTOEXEC.BAT` would look something like this:

```
ECHO <ESC>[0;84;"DIR A:";13p
ECHO <ESC>[0;85;"DIR C:";13p
ECHO <ESC>[0;86;"DIR "p
```

These define Shift-F1 to execute a DIR on drive A; and Shift-F2 to do the same thing for drive C. Shift-F3 also does a DIR but without the carriage return. In this way, you can do a Shift-F3, then type in the parameter you want and press Enter.

You'll find that these ANSI redefini-

tions work on the DOS command level and within programs that use DOS for keyboard input (such as `EDLIN` and `DEBUG`), but they will not work in `BASIC` or in most large applications. Programs that are not affected by these redefined keys use BIOS rather than DOS to obtain keyboard input.

If the redefined keys work in a program in which you don't want them to work, you can redefine the keys back to normal with another batch file looking something like this:

```
ECHO <Esc>[0;84;"0;84p
ECHO <Esc>[0;85;"0;85p
ECHO <Esc>[0;86;"0;86p
```

ROLLING YOUR OWN Although programs that allow you to define keyboard macros can become quite complex, let's explore how such programs work by doing something very simple.

If you use the number pad a lot for entering numbers into spreadsheets or other programs, you may sometimes have wished that you could use the gray Plus key as an alternative Enter key. You might try using `ANSI.SYS` to do it with the following ANSI sequence

```
<Esc>[43;13p
```

where 43 is the decimal ASCII code for the Plus sign, and 13 is the ASCII code for Enter. Unfortunately, however, this will redefine both your gray Plus and Plus sign keys as Enter. Moreover, it probably wouldn't work in a spreadsheet program where it would be of most use.

So, let's create a dedicated program that will redefine the gray Plus key as an Enter key. Better yet, let's create two of them.

The first program, `NEWINT1`, works by intercepting calls to Interrupt 16h. Whenever a program tries to call Interrupt 16h to obtain keyboard information, `NEWINT1` steps in before the Interrupt 16h call is answered. It checks to see if the keystroke is the gray Plus key (with a scan code returned in register AH equal to 4Eh and the ASCII code returned in register AL equal to 2Bh.) If so, it returns to the calling program an Enter key (scan code 1Ch and ASCII code 0Dh) instead. For any other keystroke, `NEWINT1` steps aside and allows the regular Interrupt 16h routine to proceed.

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The NEWENT1 program is shown in Figure 1 in the form of a DEBUG script file. That is, it contains the keystrokes that, when typed into DEBUG, will create the NEWENT1.COM program. Using an ASCII text editor (such as EDLIN, or WordStar in nondocument mode, or Microsoft Word saved without formatting), type the lines into a file called NEWENT1.SCR. Make sure you leave a blank line where I have one. You don't have to type in the semicolons or anything to the right of the semicolons. These are comments to let you know what's going on.

When you've created the NEWENT1.SCR file, run the command

```
DEBUG <NEWENT1.SCR
```

and NEWENT1.COM will be created for you. Run NEWENT1.COM by typing

```
NEWENT1
```

The program will remain resident in memory and your gray Plus key will be an Enter key until you reboot or turn off your computer.

This Interrupt 16h interceptor is complicated by the fact that Interrupt 16h actually includes three function calls. A program calling Interrupt 16h specifies the

function call number in register AH. Function Call 0 is simply to get the next keystroke. Function Call 1 is for the keyboard status, where the routine returns the zero flag set if no keys are currently available. The zero flag is cleared if a key is ready. For a status call, the keystroke is returned in register AX just like Function Call 0, but it is not removed from the keyboard buffer. For the status function call, NEWENT1 converts the key anyway, just in case there exists a program that will get confused if the key it gets from Function Call 0 is not the same as that returned from Function Call 1. Function Call 3 of Interrupt 16h returns shift statuses. NEWENT1 just lets that one pass to the BIOS Interrupt 16h routine.

A RESIDENT INTERRUPT 9H HANDLER The NEWENT1 program shown in Figure 1 converts all gray Plus keystrokes into Enter keystrokes. That's not really necessary. You really only need something that converts the gray Plus key when NumLock has been toggled or when one of the Shift keys is down. That way the gray Plus key will be an Enter only when the number pad is typing numbers.

The NEWENT1 program shown in Figure 1 could be altered to check for the NumLock and shift states, but that approach has a subtle problem. The shift statuses it checks will be those at the time a program retrieves the keystroke from Interrupt 16h and possibly not those in effect at the instant you actually press the gray Plus key.

The NEWENT2 program shown in Figure 2 takes care of this problem by intercepting Interrupt 9, which is the hardware keyboard interrupt routine. It reads the keystroke from an input port and also checks the shift status states stored in lower memory. It converts the key only if NumLock is toggled, or if either the Left or Right Shift key is depressed. Like the number pad, NEWENT2 will not convert the key if NumLock is toggled and a Shift key is down.

If NEWENT2 converts the key, it has to clear the keyboard I/O ports, store the key in the keyboard buffer in lower memory, and re-enable the interrupts. (The only place the methodology behind this is documented is in the assembly lan-

guage code for the BIOS Interrupt 9h in any of the *Technical Reference* manuals for the PC family. However, you'll find some of the same code in any keyboard macro program and in many resident pop-up programs.)

A GIFT FROM DOS 3.X How about a third method to convert the gray Plus key into an Enter key?

PC-DOS 3.0 and 3.1 include several resident programs that entirely replace the BIOS Interrupt 9 keyboard handler. These programs are called KEYBUC.COM, KEYBGR.COM, KEYBFR.COM, KEYBIT.COM, and KEYBSP.COM. They are designed to be used with foreign-language keyboards for the United Kingdom, Germany, France, Italy, and Spain,

```

NEWENT1.COM
A
JMP 0130          ; Do initialization
OR  P,0
OR  AX,AX
JE  0134          ; Check if Get Key
CMP AH,01
JZ  0123          ; Check if Status
CS  PUSP
PUSH PAX [0102]  ; Otherwise
                ; Get Int 16h key
CALL PAX [0102]
CMP AX,01020
JNE 0122          ; See if gray-plus
MOV  AX,ICD
JNE 0121          ; If no, make Enter
                ; And leave
JMP 0120          ; Get Int 16h status
CS  PUSP
CALL PAX [0102]
JE  0135          ; Leave if no key
CMP AX,01020
JNE 0135          ; See if gray-plus
                ; If no, make Enter
                ; Clear Zero flag
                ; And leave
MOV  AX,5546
JNE 0121          ; Save Int. 16h
JMP 0120
MOV  [0102],AX
MOV  [0104],AX
JNE 0121          ; Get Int. 16h
JMP 0120
MOV  AX,0130
JNE 0121          ; Terminate and
                ; stay resident
H  CX
J  0
W  0

```

Figure 1: You can make a DEBUG script called NEWENT1.SCR by typing these lines into a file. The program that DEBUG will make from this script is called NEWENT1.COM and will redefine the gray Plus key as an Enter key.

```

NEWENT2.COM
JMP 0140          ; Jump to Initialize
OR  P,0
PUSH AX
PUSH DI
IN  AL,00
CMP AL,40
JNE 0150          ; Need key
                ; Check if gray-plus
MOV  AX,0040
MOV  DS,AX
MOV  SI,[0102]
AND AL,2F
JZ  0150          ; Check if Num Lock
                ; or upper shifts
JZ  0123
CMP AL,20
JZ  0123
CMP AL,03
JA  0150          ; Reset keyboard
IN  AL,AL
OR  AL,AL
MOV  AL,AX
OUT  01,AL
PUSH DI
PUSH 01
MOV  AX,ICD
MOV  SI,[010C]
MOV  DI,00
ADD SI,002
CMP SI,[0102]
JNE 0147          ; Set key to Enter
                ; Get buffer tail
MOV  SI,[0100]
INC SI
CMP SI,[010A]
JNE 0151          ; Increment
                ; See if wrap around
JZ  0147
MOV  SI,[0100]
CMP SI,[010A]
JNE 0151          ; If no, set to beg
                ; New if buffer full
JZ  0151
MOV  [01],AX
MOV  [010C],AX
POP  DI
POP  SI
CALL 0140
OUT  20,AL
MOV  AX
POP  AX
JMP 0140          ; Re-enable interrupts
INT  09
POP  DI
POP  SI
CALL 0102
PUSH PAX [0102]
MOV  AX,3540
JNE 0140          ; Get Int. 9h address
JZ  0140
MOV  [0102],AX
MOV  [0104],AX
JNE 0140          ; Set a new one
JZ  0140
MOV  AX,2540
JNE 0140          ; Terminate and
                ; stay resident
JZ  0140
H  CX
J  0
W  0

```

Figure 2: You can create NEWENT2.COM from this DEBUG script. Call the file containing these statements NEWENT2.SCR.

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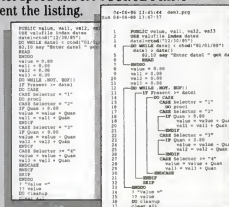
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■ PC LAB NOTES

but we can take these programs and do whatever we want with them.

If you use one of these programs (patched or unpatched) to redefine the keyboard, load it first in your AUTOEXEC .BAT file. The KEYBxx programs take over Interrupt 9 completely and will disable any resident programs that are triggered by the keyboard. Once the KEYBxx program is loaded, you can flip back to the U.S. keyboard by typing Ctrl-Alt-F1. Ctrl-Alt-F2 enables the foreign-language configuration again. Let's use KEYBUK.COM because the U.K. keyboard is closest to the U.S. keyboard definitions.

The byte that determines which keyboard is currently in effect is located at offset 107h in the DOS 3.1 version of KEYBUK (103h in the DOS 3.0 version). When the U.S. keyboard is in effect, this byte is 00; the U.K. keyboard is indicated by an FFh in the address. In the .COM file, the initialization code sets it to FFh. In the

patches below, however, the first DEBUG E command makes the initialization code set it to 00, so the U.S. keyboard will be in effect when the program is loaded.

The keyboard lookup tables in these .COM files begin at offset 653h in the DOS 3.1 version (528h in DOS 3.0). They are arranged more or less as follows: U.K. base case, U.K. shifts, Alt keys, Ctrl keys, Ctrl function keys, Ctrl keypad, U.S. base case, U.S. shifts, shift function keys, Alt function keys, shift keypad, and base keyboard. (These tables are arranged differently in DOS 3.0.) The gray Plus key is in the "shift keypad" section at offset 7E0h (686h for DOS 3.0). So all we need do is change it to 0Dh, the Enter key.

This is the DEBUG session to patch the DOS 3.1 version of KEYBUK.COM:

```
COPY KEYBUK.COM NEWENT3.COM
DEBUG NEWENT3.COM
E 92B 0D
E 7E0 0D
```


W
Q

For DOS 3.0, the two E commands in DEBUG are instead

```
E 788 0D
E 686 0D
```


Now execute NEWENT3 and the gray Plus key will be changed to an Enter key. If you want the gray Plus key back to normal again, type Ctrl-Alt-F2. (Unfortunately, this will also bring into effect the U.K. keyboard.) Since you have access to the keyboard mapping tables in these keyboard programs, you can make extensive modifications (such as patching KEYBUK.COM to enable a Dvorak keyboard that could be accessed with Ctrl-Alt-function key combinations). I've given you the first few clues.

Charles Petzold is a contributing editor of PC Magazine.



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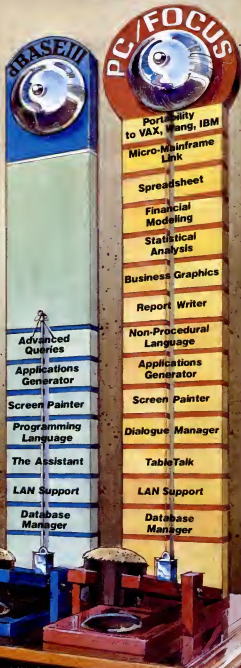


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■ PROGRAMMING/UTILITIES

[illegible]

```

mov ah,0          ;same MCM BIOS "get status" function
int 17h           ;test bit 3, I/O error indicator
jc eteh           ;if clear, there no error
;clear error flag
eteh:              rclr error flag
stti:             ctc
                 setl error flag
lpolestat         endq

=====
;BEEP uses the 8253 timer chip to emit a short beep thru the PC's speaker.
beep:             proc near
                mov ax,0A02h        ;notify 8253 that frequency data is coming
                mov al,0            ;start frequency (776 Hz)
                out 8Eah            ;send frequency (776 Hz)
                mov ax,-6           ;set count
                out 8Eah            ;set count
                jmp ax,4F           ;pollinate speaker
                mov cx,9000h        ;time delay for sound duration
                loop $-loop         ;deactivate speaker
                mov ax,-352         ;
                out 8Eah            ;
                jmp ax,4F           ;
beep:             endp
;=====
;NON-WAITING subroutine transfers a non-overlapping block of memory one byte at a time.
$PTR:=  
DDESI = DESI + 8  
  
[Figure 1 continued]

```

screen when the menu window is called, (2) sets up a buffer area that is used later to temporarily store the contents of the screen underneath the window for subsequent restoration, (3) changes the keyboard interrupt vector to point to the body of the new program, and (4) terminates through Interrupt 27h to remain resident in memory. If the machine is a PCjr, the word stored at offset 60h in the ROM BIOS data area (beginning at 0040:0000) that defines the starting and ending scan lines for the cursor is corrected. The PCjr ROM BIOS initialization routines themselves correctly set the cursor shape physically with the 6845 video controller but reverse the low- and high-order bytes of the word when storing the information in RAM.

If you study the source code listing for the program, you'll notice that the text of the menu window is stored in a table and that 2 bytes are set aside to define the attributes used in the window. Storing them in this way makes it easier to modify the attributes with DEBUG and easier to set up the text area with an assembler. Once the initialization routine is complete, however, an image of the window exactly as it will be transferred to video memory is stored in the location labeled WINDOW_TEXT in the form of words composed of text/attribute byte pairs. Video RAM in text modes on the PC is organized in a way that interleaves text and attribute bytes. Thus, offset 0 in the video segment holds the ASCII value of the character in the upper-left-hand corner of the screen, offset 1 holds the attribute of that character, offset

2 holds the second character on line 1, and so on. Storing the contents of a pop-up window in the same way is convenient for writing the window to the display with a series of MOVSW instructions to move text/attribute word pairs. At start-up, the current video mode is checked, and if the mode number returned is 7 (indicating that a monochrome adapter is being used), the 2 attribute bytes are changed to the values 70h and 07h, which are appropriate for that display adapter.

Every time a key on the PC keyboard is pressed, an Interrupt 9 is generated. This signals the 8088 that a byte is waiting to be read from the keyboard port. The interrupt routine fetches that byte and either places a pair of bytes corresponding to that key closure into the keyboard buffer or manipulates bits in the shift status register that indicate the current status of (among other things) the Ctrl key and the Shift keys. SETUP redirects that keyboard interrupt to a new routine that first calls the old interrupt routine as a subroutine, then checks the shift status register to see if the Ctrl-Right Shift key combination is being pressed. If it's not, then a return from interrupt is issued and the PC goes on about its way. If, however, the two trigger keys are depressed, then execution jumps to the routine that opens the menu window and solicits input from the user pertaining to printer setup options.

Before the window is opened, the program verifies that the window isn't already open. If that checks out, then the current display mode is compared against the list

of modes that SETUP supports. If either test fails, then control is taken away from SETUP's interrupt handler as if the Ctrl-Right Shift combination had never been entered.

When the menu window is active and a function key press is detected, the scan code of the function key is translated into an address that marks the beginning of the string of printer control codes. Each string may be up to 16 bytes long and is terminated by a byte of value 255 (hex FF) that serves as a delimiter for the internal routine that sends a string to LPT1:. The printer status is checked, and if the return code is positive, the string is sent. Otherwise, a warning beep tells you to check your printer. The loop that accepts keyboard input is entered again, and the cycle continues until Esc is pressed, whereupon the menu window is erased by writing the original contents of that area to video memory, and the interrupt routine terminates with an IRET instruction.

SNOW REMOVAL. On a standard color/graphics adapter, direct writing to video memory unchecked causes hash lines ("snow") to appear on the screen. This is caused by the dual-ported design of the adapter's video RAM. One way around that is to check the Vertical Sync bit of the CGA Status Register, port 3DAh, before each byte or word is written, so as to ensure that writing is done only during the vertical retrace cycle of the raster scan. That works, but it slows down output considerably. The method for direct screen

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■ PROGRAMMING/UTILITIES

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1      EDI2 - destination
2      CX - number of bytes
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(Figure 1 continues)

```

loop init3
movsb                                send the last in each line is attributal
mov al,attributal
mov cx,cx-1                          loop until all li linee are done
jnz loop3                             write the last four linee just like
                                        the first four
init4:
mov cx,4
mov cx,cx-1
loop init4
}
;check the machine ID byte in ROM and if this is a PCjr, then reset the
cursor and erect the CURSOR_MODE word at $609.$60A.
mov rcx,rom                            just do to rom
mov dx,$60A
assume ds=rom
mov machine_id,$F0B0                    is this a PCjr?
cmp machine_id,$F0B0                   yes, then skip this routine
jne init5                               just do to ROM BIOS date area
mov ax,$080E,bios_date                 mov dx,ax
mov dx,$080E                           assume ds=rom,bios_date
mov cursor_mode,$607B                  ;reset the cursor mode indicator
mov ah,1                                ;then physically reset the cursor
mov cr,$607B
int 1Bh
}
;now save the mid keyboard interrupt vector and replace it with the new one.
init5:
mov ax,interrupts                      just do to the interrupt vector area
mov dx,$A
assume ds=interrupts
mov si,keyboard_irq                     save mid vector
mov cid_keyboard_irq,$A
mov si,keyboard_int[2]
mov cid_keyboard_int[2],$A
cld                                     disable all interrupts but NMi
mov keyboard_int_offset,mid            and install new vector
mov keyboard_int[2],cx
sti                                     re-enable interrupts
mov dx,offset initialize               point to end of resident section
int 1Bh                                terminate-but-never-resident
endp
initialize
code
ends
end main

```

(Figure 1 ends)

writing employed by SETUP.COM is that used in the ROM BIOS scroll routines, instead. In this procedure, the entire display is momentarily blanked while video memory is manipulated, then turned back on. To the user, the visible effect is a brief but perceptible flicker, but the menu window seems to appear instantaneously and the snow effect is eliminated. The display is blanked by sending the value 25h to the CGA's Mode Control Register (which is mapped into memory at 3D8h). The display is re-enabled by sending a byte read from a table (the value varies for each video mode) to the same location, via the 8088's OUT instruction. The VIDEO_DISABLE and VIDEO_ENABLE routines in the source code have no effect on adapters other than the CGA, to which this snow (hash) phenomenon is unique, since other boards map their input ports into different memory locations.

MODIFYING SETUP.COM As it appears here, SETUP.COM is designed for Epson FX and RX series printers configured as LPT1:. If your printer's control codes are not Epson-compatible, if your printer is set up as LPT2: or LPT3:, or if you just want to make changes to the text of the menu or the color attributes it employs, it's easy to do. If you have typed in or downloaded the assembler source code,

you can make whatever changes you like with your favorite text editor and reassemble the program. The source listing is commented and self-explanatory. An alternative method is to use DEBUG to implement desired modifications, and SETUP is designed so that you can do just that. The four modifications that will commonly be made are listed here along with a short explanation of each change and the key addresses that are pertinent to DEBUG.

The 2 color-attribute bytes used to form the window are stored at offsets 010Ch and 010Dh in the code segment (remember that the code portion of a .COM file starts at offset 100h). The byte at 010Ch defines the attribute to be used in the first and last four lines of the menu window, and the byte at 010Dh defines the color of the middle 11 lines, in which the printer options are listed, together with the appropriate function keys. Initially, for a color system, 010Ch is set to 4Fh (white on red) and 010Dh is set to 70h (black on white). Using DEBUG's Enter command, you can set these bytes to whatever you want in accordance with the definition of an attribute byte, in which the lower half of the byte holds the foreground color and the upper half the background color. If you use a monochrome adapter, changing these attributes will have no effect on the window.

The text of the menu window is a 532-

byte table composed of 19 rows of 28 characters each, starting at offset 011Eh. The first byte, C9h, is the ASCII code for the graphics character that forms the upper-left-hand corner of the window border. Using the DEBUG Dump command, it's easy to pinpoint the starting location of any given line in the menu and change it to read what you want. The P in "PRINTER SETUP MENU," for instance, resides at location 013Fh in the code segment, as is shown when DEBUG is given the command D 011E and the text equivalent of each byte is printed on the screen in the field to the right of the hex dump.

If your printer is not installed as LPT1:, but as LPT2: or LPT3: instead, changing 2 bytes will reconfigure SETUP to work with your system. The byte at offset 0C44h and the one at 0C4Eh are currently set to 0 to send printer output to LPT1: through BIOS Interrupt 17h, but setting each one to 1 or 2 for LPT2: or LPT3:, respectively, will specify the proper port as the output destination.

PRINTER CONTROL CODE STRINGS

Control code strings that are sent to the printer to execute setup options are stored in a table labeled CODE_TABLE in the source listing, beginning at location 096Eh. Each function key (and each shifted function key, with the exception of F19

```

100 REM --- BASIC PROGRAM TO CREATE setup.COM
110 OPEN "setup.COM" AS #1 LEN = 1
120 FIELD #1,1 AS #
130 CHECKSUM = 0
140 FOR I% = 1 TO 392
150   LINE$ = " "
160   FOR J% = 1 TO 8
170     READ BYTES
180     CHECKSUM = CHECKSUM + BYTES
190     LINE$ = LINE$ + BYTES
200   NEXT J%
210   PUT #1
220 NEXT I%
230 READ LINECHECKER
240 IF LINECHECKER <> LINE$ THEN PRINT "Error In Line";J% + 18 + 18
250 NEXT J%
260 CLOSE
270 IF CHECKSUM = 135441 THEN PRINT "Successful Completion!" : END
280 PRINT "COM file is not valid!" : END
290 DATA 231, 176, 11, 40, 67, 41, 32, 67, 678
300 DATA 111, 112, 121, 114, 185, 189, 184, 114, 884
310 DATA 312, 49, 97, 54, 66, 12, 98, 414
320 DATA 285, 182, 182, 45, 48, 97, 118, 185, 742
330 DATA 115, 52, 89, 117, 98, 188, 185, 335, 778
340 DATA 184, 185, 118, 182, 12, 67, 111, 189, 742
350 DATA 112, 97, 118, 121, 12, 26, 8, 499
360 DATA 8, 8, 8, 8, 8, 8, 8, 8
370 DATA 312, 45, 41, 8, 184, 8, 189, 8, 361
380 DATA 184, 8, 189, 8, 176, 8, 8, 8, 549
390 DATA 8, 281, 285, 285, 285, 285, 285, 285, 1431
400 DATA 285, 285, 285, 285, 285, 285, 285, 285, 1448
410 DATA 285, 285, 285, 285, 285, 285, 285, 285, 1448
420 DATA 285, 285, 285, 285, 187, 188, 12, 32, 1271
430 DATA 12, 68, 78, 84, 69, 538
440 DATA 82, 32, 83, 69, 64, 85, 88, 32, 347
450 DATA 72, 69, 78, 32, 32, 32, 32, 437
460 DATA 186, 186, 32, 32, 32, 32, 68, 88, 788
470 DATA 78, 78, 32, 32, 82, 48, 47, 78, 884
480 DATA 32, 68, 82, 72, 78, 84, 69, 82, 348
490 DATA 93, 32, 32, 32, 188, 199, 386, 386, 358
500 DATA 198, 198, 196, 196, 198, 198, 196, 196, 1561
510 DATA 198, 198, 196, 196, 198, 198, 196, 196, 1561
520 DATA 198, 198, 196, 196, 198, 198, 196, 196, 1561
530 DATA 182, 186, 32, 78, 49, 32, 32, 32, 835
540 DATA 32, 67, 111, 189, 122, 114, 181, 115, 761
550 DATA 115, 114, 189, 32, 67, 111, 188, 181, 737
560 DATA 32, 32, 32, 32, 386, 189, 32, 78, 692
570 DATA 98, 32, 32, 69, 32, 112, 478
580 DATA 97, 118, 189, 182, 189, 32, 77, 112, 729
590 DATA 181, 32, 32, 32, 32, 32, 32, 32, 32
600 DATA 188, 186, 32, 78, 51, 32, 32, 32, 821
610 DATA 32, 69, 189, 112, 184, 97, 115, 188, 743
620 DATA 112, 181, 189, 112, 111, 188, 181, 743
630 DATA 32, 32, 32, 32, 188, 188, 32, 78, 692
640 DATA 32, 32, 32, 68, 112, 117, 678
650 DATA 98, 188, 181, 45, 83, 124, 114, 185, 718
660 DATA 181, 32, 189, 112, 188, 112, 64, 32, 841
670 DATA 188, 188, 32, 78, 51, 32, 32, 32, 835
680 DATA 32, 69, 189, 188, 118, 182, 32, 77, 448
690 DATA 112, 188, 32, 32, 32, 32, 32, 32, 32, 448
700 DATA 72, 32, 32, 32, 32, 188, 188, 32, 78, 692
710 DATA 72, 32, 32, 78, 77, 188, 112, 478
720 DATA 189, 97, 116, 117, 114, 181, 32, 77, 759
730 DATA 116, 181, 189, 112, 114, 181, 32, 77, 759
740 DATA 188, 186, 32, 78, 18, 32, 32, 32, 835
750 DATA 32, 69, 189, 112, 32, 32, 181, 452
760 DATA 114, 182, 112, 114, 97, 116, 189, 112, 878
770 DATA 116, 32, 32, 32, 146, 146, 32, 78, 698
780 DATA 58, 32, 32, 32, 73, 118, 188, 467
790 DATA 181, 118, 116, 32, 78, 181, 192, 114, 754
800 DATA 32, 77, 97, 114, 181, 189, 114, 32, 618
810 DATA 188, 146, 32, 78, 57, 32, 32, 32, 827
820 DATA 32, 81, 115, 181, 114, 32, 78, 681
830 DATA 112, 45, 181, 45, 181, 181, 181, 787
840 DATA 114, 189, 32, 32, 146, 188, 32, 78, 761
850 DATA 68, 32, 32, 82, 188, 112, 478
860 DATA 181, 116, 32, 98, 114, 189, 118, 114, 774
870 DATA 77, 32, 118, 182, 118, 32, 698
880 DATA 188, 186, 32, 69, 83, 67, 32, 12, 687
890 DATA 32, 69, 118, 185, 116, 32, 32, 32, 518
900 DATA 32, 32, 32, 32, 32, 32, 32, 32, 32
910 DATA 32, 32, 32, 32, 32, 146, 199, 196, 198, 995
920 DATA 198, 198, 196, 196, 198, 198, 196, 196, 1561
930 DATA 198, 198, 196, 196, 198, 198, 196, 196, 1561
940 DATA 198, 198, 196, 196, 198, 198, 196, 196, 1561
950 DATA 182, 186, 32, 85, 118, 115, 184, 189, 919
960 DATA 182, 116, 182, 188, 58, 32, 32, 32, 571
970 DATA 84, 112, 182, 181, 181, 181, 181, 181, 787
980 DATA 78, 32, 32, 32, 188, 188, 32, 81, 681
990 DATA 188, 188, 182, 114, 91, 188, 188, 188, 188
1000 DATA 32, 32, 32, 32, 68, 112, 183, 183, 529
1010 DATA 188, 188, 32, 78, 32, 32, 32, 32, 32
1020 DATA 188, 188, 285, 285, 285, 285, 285, 285, 1616
1030 DATA 285, 285, 285, 285, 285, 285, 285, 285, 1648
1040 DATA 285, 285, 285, 285, 285, 285, 285, 285, 1648
1050 DATA 285, 285, 285, 285, 188, 8, 8, 8, 1889
1060 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1070 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1080 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1090 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1100 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1110 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1120 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
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1190 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
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1320 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
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1470 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1480 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1490 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1500 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1510 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1520 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
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1580 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1590 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1600 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1610 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1620 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1630 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1640 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
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1670 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1680 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1690 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1700 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1710 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1720 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1730 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1740 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1750 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1760 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1770 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1780 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1790 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1800 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1810 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1820 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1830 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1840 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
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1860 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1870 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1880 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1890 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1900 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1910 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1920 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1930 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1940 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1950 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1960 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1970 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1980 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
1990 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2000 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8

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2000 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2010 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2020 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2030 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2040 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2050 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2060 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2070 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2080 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2090 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2100 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2110 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2120 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2130 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2140 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2150 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2160 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2170 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2180 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2190 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2200 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2210 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2220 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2230 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2240 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2250 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2260 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2270 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2280 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2290 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2300 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2310 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2320 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2330 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2340 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2350 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2360 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2370 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2380 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2390 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2400 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2410 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2420 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2430 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2440 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2450 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2460 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2470 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2480 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2490 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2500 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2510 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2520 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2530 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2540 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2550 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2560 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2570 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2580 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2590 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2600 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2610 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2620 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2630 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2640 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2650 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2660 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2670 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2680 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2690 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2700 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2710 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2720 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2730 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2740 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2750 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2760 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2770 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2780 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2790 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2800 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2810 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2820 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2830 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2840 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2850 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2860 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2870 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2880 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2890 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2900 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2910 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2920 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2930 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2940 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2950 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2960 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2970 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2980 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
2990 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8
3000 DATA 8, 8, 8, 8, 8, 8, 8, 8, 8

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(Figure 2 continues)

Figure 2: This BASIC program will automatically create SETUP.COM

■ PROGRAMMING/UTILITIES

[illegible]

(Figure 2 continues.)

13440 DART	8,	0,	0,	0,	0,	0,	0
13450 DART	8,	10,	27,	88,	27,	50,	355,
13460 DART	8,	11,	27,	88,	27,	50,	355,
13470 DART	8,	27,	70,	255,	0,	0,	0,
13480 DART	8,	27,	100,	0,	0,	0,	0,
13490 DART	8,	27,	100,	0,	250,	0,	300
14400 DART	8,	0,	0,	0,	0,	0,	0
14410 DART	253,	60,	0,	0,	0,	0,	0
14420 DART	30,	0,	0,	230,	160,	0,	160
14430 DART	30,	27,	27,	0,	0,	0,	0
14440 DART	36,	0,	0,	110,	0,	7,	31
14450 DART	0,	94,	0,	0,	0,	0,	0
14460 DART	0,	94,	0,	0,	0,	0,	0
14470 DART	0,	94,	0,	0,	0,	0,	0
14480 DART	0,	117,	235,	109,	15,	205,	10
14490 DART	0,	117,	235,	109,	15,	205,	10
14500 DART	7,	110,	2,	235,	137,	0,	0
14510 DART	0,	0,	0,	0,	0,	0,	0
1510 DART	1,	0,	110,	237,	101,	0,	0
1511 DART	1,	0,	110,	237,	101,	0,	0
1512 DART	48,	137,	14,	50,	1	100,	203
1513 DART	22,	205,	16,	0,	109,	10,	0
1514 DART	0,	0,	0,	0,	0,	0,	0
1515 DART	107,	0,	0,	0,	0,	0,	0
1516 DART	0,	107,	235,	109,	15,	205,	10
1517 DART	0,	107,	235,	109,	15,	205,	10
1518 DART	0,	107,	235,	109,	15,	205,	10
1519 DART	0,	107,	235,	109,	15,	205,	10
1520 DART	0,	107,	235,	109,	15,	205,	10
1521 DART	0,	107,	235,	109,	15,	205,	10
1522 DART	0,	107,	235,	109,	15,	205,	10
1523 DART	0,	107,	235,	109,	15,	205,	10
1524 DART	0,	107,	235,	109,	15,	205,	10
1525 DART	0,	107,	235,	109,	15,	205,	10
1526 DART	0,	107,	235,	109,	15,	205,	10
1527 DART	0,	107,	235,	109,	15,	205,	10
1528 DART	0,	107,	235,	109,	15,	205,	10
1529 DART	0,	107,	235,	109,	15,	205,	10
1530 DART	0,	107,	235,	109,	15,	205,	10
1531 DART	0,	107,	235,	109,	15,	205,	10
1532 DART	0,	107,	235,	109,	15,	205,	10
1533 DART	0,	107,	235,	109,	15,	205,	10
1534 DART	0,	107,	235,	109,	15,	205,	10
1535 DART	0,	107,	235,	109,	15,	205,	10
1536 DART	0,	107,	235,	109,	15,	205,	10
1537 DART	0,	107,	235,	109,	15,	205,	10
1538 DART	0,	107,	235,	109,	15,	205,	10
1539 DART	0,	107,	235,	109,	15,	205,	10
1540 DART	0,	107,	235,	109,	15,	205,	10
1541 DART	0,	107,	235,	109,	15,	205,	10
1542 DART	0,	107,	235,	109,	15,	205,	10
1543 DART	0,	107,	235,	109,	15,	205,	10
1544 DART	0,	107,	235,	109,	15,	205,	10
1545 DART	0,	107,	235,	109,	15,	205,	10
1546 DART	0,	107,	235,	109,	15,	205,	10
1547 DART	0,	107,	235,	109,	15,	205,	10
1548 DART	0,	107,	235,	109,	15,	205,	10
1549 DART	0,	107,	235,	109,	15,	205,	10
1550 DART	0,	107,	235,	109,	15,	205,	10
1551 DART	0,	107,	235,	109,	15,	205,	10
1552 DART	0,	107,	235,	109,	15,	205,	10
1553 DART	0,	107,	235,	109,	15,	205,	10
1554 DART	0,	107,	235,	109,	15,	205,	10
1555 DART	0,	107,	235,	109,	15,	205,	10
1556 DART	0,	107,	235,	109,	15,	205,	10
1557 DART	0,	107,	235,	109,	15,	205,	10
1558 DART	0,	107,	235,	109,	15,	205,	10
1559 DART	0,	107,	235,	109,	15,	205,	10
1560 DART	0,	107,	235,	109,	15,	205,	10
1561 DART	0,	107,	235,	109,	15,	205,	10
1562 DART	0,	107,	235,	109,	15,	205,	10
1563 DART	0,	107,	235,	109,	15,	205,	10
1564 DART	0,	107,	235,	109,	15,	205,	10
1565 DART	0,	107,	235,	109,	15,	205,	10
1566 DART	0,	107,	235,	109,	15,	205,	10
1567 DART	0,	107,	235,	109,	15,	205,	10
1568 DART	0,	107,	235,	109,	15,	205,	10
1569 DART	0,	107,	235,	109,	15,	205,	10
1570 DART	0,	107,	235,	109,	15,	205,	10
1571 DART	0,	107,	235,	109,	15,	205,	10
1572 DART	0,	107,	235,	109,	15,	205,	10
1573 DART	0,	107,	235,	109,	15,	205,	10
1574 DART	0,	107,	235,	109,	15,	205,	10
1575 DART	0,	107,	235,	109,	15,	205,	10
1576 DART	0,	107,	235,	109,	15,	205,	10
1577 DART	0,	107,	235,	109,	15,	205,	10
1578 DART	0,	107,	235,	109,	15,	205,	10
1579 DART	0,	107,	235,	109,	15,	205,	10
1580 DART	0,	107,	235,	109,	15,	205,	10
1581 DART	0,	107,	235,	109,	15,	205,	10
1582 DART	0,	107,	235,	109,	15,	205,	10
1583 DART	0,	107,	235,	109,	15,	205,	10
1584 DART	0,	107,	235,	109,	15,	205,	10
1585 DART	0,	107,	235,	109,	15,	205,	10
1586 DART	0,	107,	235,	109,	15,	205,	10
1587 DART	0,	107,	235,	109,	15,	205,	10
1588 DART	0,	107,	235,	109,	15,	205,	10
1589 DART	0,	107,	235,	109,	15,	205,	10
1590 DART	0,	107,	235,	109,	15,	205,	10
1591 DART	0,	107,	235,	109,	15,	205,	10
1592 DART	0,	107,	235,	109,	15,	205,	10
1593 DART	0,	107,	235,	109,	15,	205,	10
1594 DART	0,	107,	235,	109,	15,	205,	10
1595 DART	0,	107,	235,	109,	15,	205,	10
1596 DART	0,	107,	235,	109,	15,	205,	10
1597 DART	0,	107,	235,	109,	15,	205,	10
1598 DART	0,	107,	235,	109,	15,	205,	10
1599 DART	0,	107,	235,	109,	15,	205,	10
1600 DART	0,	107,	235,	109,	15,	205,	10
1601 DART	0,	107,	235,	109,	15,	205,	10
1602 DART	0,	107,	235,	109,	15,	205,	10
1603 DART	0,	107,	235,	109,	15,	205,	10
1604 DART	0,	107,	235,	109,	15,	205,	10
1605 DART	0,	107,	235,	109,	15,	205,	10
1606 DART	0,	107,	235,	109,	15,	205,	10
1607 DART	0,	107,	235,	109,	15,	205,	10
1608 DART	0,	107,	235,	109,	15,	205,	10
1609 DART	0,	107,	235,	109,	15,	205,	10
1610 DART	0,	107,	235,	109,	15,	205,	10
1611 DART	0,	107,	235,	109,	15,	205,	10
1612 DART	0,	107,	235,	109,	15,	205,	10
1613 DART	0,	107,	235,	109,	15,	205,	10
1614 DART	0,	107,	235,	109,	15,	205,	10
1615 DART	0,	107,	235,	109,	15,	205,	10
1616 DART	0,	107,	235,	109,	15,	205,	10
1617 DART	0,	107,	235,	109,	15,	205,	10
1618 DART	0,	107,	235,	109,	15,	205,	10
1619 DART	0,	107,	235,	109,	15,	205,	10
1620 DART	0,	107,	235,	109,	15,	205,	10
1621 DART	0,	107,	235,	109,	15,	205,	10
1622 DART	0,	107,	235,	109,	15,	205,	10
1623 DART	0,	107,	235,	109,	15,	205,	10
1624 DART	0,	107,	235,	109,	15,	205,	10
1625 DART	0,	107,	235,	109,	15,	205,	10
1626 DART	0,	107,	235,	109,	15,	205,	10
1627 DART	0,	107,	235,	109,	15,	205,	10
1628 DART	0,	107,	235,	109,	15,	205,	10
1629 DART	0,	107,	235,	109,	15,	205,	10
1630 DART	0,	107,	235,	109,	15,	205,	10
1631 DART	0,	107,	235,	109,	15,	205,	10
1632 DART	0,	107,	235,	109,	15,	205,	10
1633 DART	0,	107,	235,	109,	15,	205,	10
1634 DART	0,	107,	235,	109,	15,	205,	10
1635 DART	0,	107,	235,	109,	15,	205,	10
1636 DART	0,	107,	235,	109,	15,	205,	10
1637 DART	0,	107,	235,	109,	15,	205,	10
1638 DART	0,	107,	235,	109,	15,	205,	10
1639 DART	0,	107,	235,	109,	15,	205,	10
1640 DART	0,	107,	235,	109,	15,	205,	10
1641 DART	0,	107,	235,	109,	15,	205,	10
1642 DART	0,	107,	235,	109,	15,	205,	10
1643 DART	0,	107,	235,	109,	15,	205,	10
1644 DART	0,	107,	235,	109,	15,	205,	10
1645 DART	0,	107,	235,	109,	15,	205,	10
1646 DART	0,	107,	235,	109,	15,	205,	10
1647 DART	0,	107,	235,	109,	15,	205,	10
1648 DART	0,	107,	235,	109,	15,	205,	10
1649 DART	0,	107,	235,	109,	15,	205,	10
1650 DART	0,	107,	235,	109,	15,	205,	10
1651 DART	0,	107,	235,	109,	15,	205,	10
1652 DART	0,	107,	235,	109,	15,	205,	10
1653 DART	0,	107,	235,	109,	15,	205,	10
1654 DART	0,	107,	235,	109,	15,	205,	10
1655 DART	0,	107,	235,	109,	15,	205,	10
1656 DART	0,	107,	235,	109,	15,	205,	10
1657 DART	0,	107,	235,	109,	15,	205,	10
1658 DART	0,	107,	235,	109,	15,	205,	10
1659 DART	0,	107,	235,	109,	15,	205,	10
1660 DART	0,	107,	235,	109,	15,	205,	10
1661 DART	0,	107,	235,	109,	15,	205,	10
1662 DART	0,	107,	235,	109,	15,	205,	10
1663 DART	0,	107,	235,	109,	15,	205,	10
1664 DART	0,	107,	235,	109,	15,	205,	10
1665 DART	0,	107,	235,	109,	15,	205,	10
1666 DART	0,	107,	235,	109,	15,	205,	10
1667 DART	0,	107,	235,	109,	15,	205,	10
1668 DART	0,	107,	235,	109,	15,	205,	10
1669 DART	0,	107,	235,	109,	15,	205,	10
1670 DART	0,	107,	235,	109,	15,	205,	10
1671 DART	0,	107,	235,	109,	15,	205,	10
1672 DART	0,	107,	235,	109,	15,	205,	10
1673 DART	0,	107,	235,	109,	15,	205,	10
1674 DART	0,	107,	235,	109,	15,	205,	10
1675 DART	0,	107,	235,	109,	15,	205,	10
1676 DART	0,	107,	235,	109,	15,	205,	10
1677 DART	0,	107,	235,	109,	15,	205,	10
1678 DART	0,	107,	235,	1			

(Figure 2 ends.)

and F20) can be assigned a string up to 16 bytes in length, including a delimiter byte of 255 that marks the end of the string. The beginning of the string for each successive function key starts at an address that is a multiple of 16 bytes above the base address of the table. The control string for the F1 key, for instance, which puts the printer into compressed print mode by sending the byte 15, starts at offset 096Eh; the string for the F2 key begins at 097Eh; that for the F3 key at 098Eh, and so on for all of the keys, F1 through F18. The F1 string consists simply of the bytes 15 and 255, fol-

lowed by 4 zeros. The subroutine that sends the bytes transmits the 15, then sends the 255 byte and ceases output. The string is padded with the zeros so that the string that follows it begins on a 16 byte boundary and so that its offset address can be calculated by normalizing the scan code for the key pressed, multiplying by 16, and adding the result to the base address of the table. The padding, whether by zero bytes or bytes of another value (the value is not important), is crucial to the operation of the program. To change the control code string sent by the F8 key, for example, to

send the codes 27 and 71, you would use DEBUG to change the values at addresses 09DEh, 09DFh, and 09E0h to the values 27, 71, and 255. Since each string must end with 255, the actual control code string can be no longer than 15 bytes.

It's a simple matter to snoop around in the program with DEBUG to tailor SETUP.COM to your own system. Using it will give you quick and effortless access to your printer.

Jeff Proise is an occasional contributor to PC Magazine.

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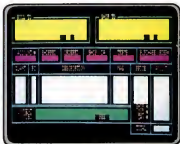
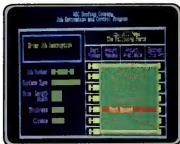
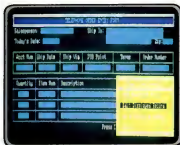


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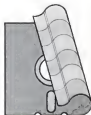
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SPREADSHEET CLINIC



Some hints to help you get the most out of your spreadsheets: building a time log, projecting dates into the future, and a better way to copy formulas.

KEEPING A LOTUS TIME LOG

It's often important to be able to keep track of the time you have spent working on a particular project. Figure 1 contains a *Symphony* macro that will record when you have started and stopped work and then will calculate the elapsed time. The macro should be in a file by itself, which you might call LOG.WRK. If you designate it as the autoloading worksheet and make %Q the autocexecuting macro, you will get a log-in time every time you use *Symphony*. When you have finished your work session, retrieve LOG.WRK and you will get an automatic log-off time and a calculation of elapsed time.

The macro builds a record of spreadsheet use like the one in Figure 2. Just be sure to format column D of LOG.WRK for dates and column E for time. Column F should contain formulas like +E5-E4 (in cell F5) to get the elapsed time. Since the macro saves the updated LOG.WRK file every time you use it, you will get a continuous record of work time.

Pat O'Brien
Burlington, Vermont

In Figure 1, I have rewritten this macro so as to shorten the code and to make it work with 1-2-3, Release 2.

BEEP WHEN FINISHED

When you're working with large spreadsheets, sorting or recalculating can take a long time. Fortunately, there's an easy way to make 1-2-3 or *Symphony* notify you when the job is done. Just hit the Backspace key after you give a command that

```

Symphony Version 1
%Q (0000-02"
  IF (CELLPOINTER ("CONTENTS")=0 "BACK" (RIGHT (ROW()-1) "LEFT" (ROW()-1) "SERVICES" ("P" "Q"))
  (0000)
  IF (IF (CELLPOINTER ("CONTENTS")=0 "BACK" (RIGHT (ROW()-1) "LEFT" (ROW()-1) "SERVICES" ("P" "Q"))
  (0000) (BACKSPACE "P")

3-2-3 Version 1
%Q (0000-02"
  IF (X(CELLPOINT ("CONTENTS")+0 "BACK" (RIGHT (ROW()-1) "LEFT" (ROW()-1) "P" "Q"))
  (0000) (BACKSPACE "P")
  
```

Figure 1: A *Symphony* macro that keeps a time log and a rewritten version that works with 1-2-3, Release 2.0.

	D	E	F
1	DATE	TIME	Net. Used
2	01-Nov-85	07:36:10 AM	
3	01-Nov-85	11:08:16 AM	03:52:26
4	01-Nov-85	02:22:13 PM	
5	01-Nov-85	02:55:18 PM	00:32:27
6	12-Nov-85	07:31:07 AM	
7	12-Nov-85	08:51:02 AM	01:23:55
8	23-Nov-85	01:52:26 PM	
9	23-Nov-85	02:44:57 PM	00:52:31
10	23-Nov-85	05:00:45 PM	
11	23-Nov-85	06:38:05 PM	01:29:28
12			00:00:00
			00:00:00

Figure 2: Time log produced by the macro shown in Figure 1. The "Hours Used" column will be zero until columns D and E are filled in by the macro.

you know will take a longer time than you want to wait. Since Backspace is an illegal key whenever you're not in Edit mode, the program will beep—but not until it has done what you told it to do. This way you don't have to keep checking the screen to see if the procedure is finished. You can go off and do something else instead. The same trick will work with macros. Just put in a {bs} whenever you want the program to beep.

Margaret McWay
Birmingham, Alabama

And if you're hard of hearing, hit Backspace four or five times.

LOOKING AHEAD

Often it's helpful to know what business day falls exactly 30, 60, or 90 days in the future, taking account of the fact that if the day falls on a weekend you want the date of the following Monday. Figure 3 shows an input screen that lets you enter a date (in cell C4) and the number of days in the period (cell D4), and gives you the first business day at the end of that period (cell E4). Cells C4 and E4 are date-formatted.

Larry Roshfeld
Needham, Massachusetts

Nice formula. Let us know when you figure out how to skip national holidays, too.

■ SPREADSHEET CLINIC

	C	D	E
3	Current Date	# of days to add	Future Date
4	26-Jan-86	62	31-Mar-86
5	Formula in cell E4 is:		
	=IF (MOD (C4+D4,7) < 2, IF (MOD (C4+D4,7) = 0, C4+D4+2, C4+D4+1), C4+D4)		

Figure 3: A formula that adds a given number of business days to the current date.

MOVE OR COPY?

When I'm building a spreadsheet model, I often want both to transfer a formula to another cell in the model and to retain the same formula in the original cell. If the original cell contains a formula with absolute cell references only, a simple copy operation will do the job. However, most of the time you will have relative references, so copying will change the formula. A /Move command, as in J-2-3, will move the formula, intact, to its new location but will erase it from the original cell.

The solution to this program limitation is to first convert the original formula into a label. In J-2-3 you do this by hitting F2, Home, and then typing an apostrophe or other label prefix. Then when you copy the contents to a new location, the cell references will not be adjusted, and you will have the same label in two cells. When you want to turn the labels back into formulas, just hit F2, Home, and Delete to get rid of the label prefix.

Mike Mullen
Lincoln, Nebraska

The method I have always used to make an unadjusted copy of a 1-2-3 formula is a little different from Mr. Mullen's. First, /Copy the formula to any cell—the one right next to it, if it's blank, is the most convenient. Since cell references will be adjusted, you'll get mush for results. Next, /Move the original cell to where you wanted the exact copy. Then /Copy the first copy you made back to its original location. Cell references will be readjusted right back to their original state. Finally, delete the unwanted first copy.

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■ EDITED BY PAUL SOMERSON

POWER USER



Patches that make WordStar far easier and more useful: an underline search routine, better box outlines, and techniques for using more-permanent placemarks.

BOXED IN

It's fairly simple to create eye-catching borders and boxes with the PC's "high-bit" character set. The characters above CHR\$(127) are often referred to as "high-bit" since the leftmost bit is a 1 rather than a 0. Having a 1 here adds 128 to the value of the other 7 bits. The binary representation of CHR\$(90), or Z, is 01011010. To add 128 to this number, change the 0 on the left side of this binary number to 1, and you get 11011010, or CHR\$(218), which is the upper-left-hand corner of a single-line box.

However, WordStar uses the high bit to identify the last letter in each word and ignores it when sending characters to your screen or printer. This is one reason WordStar files look garbled when you display their contents with the DOS TYPE command. It also explains why if you create a border in BASIC or DOS using the high-bit characters and then import it into a WordStar file, all you'll see are the "low-bit" versions of the characters.

Most WordStar users who want borders end up with crude-looking boxes made up of low-bit characters, such as

```
+-----+          +-----+
| PC |   or   | PC |
+-----+          +-----+
```

However, it's a fairly straightforward matter to have WordStar print out real borders, made up of high-bit characters, on any printer that is closely IBM-compatible. Unfortunately, unless you're using International WordStar Version 3.4 (and there's really no good reason to), your

screen will be a real mess. But if you want true borders, here's how to get them. (All of the following instructions are only for printers that can handle the high-bit graphics characters, and all involve having DEBUG.COM on the same disk as a copy of WS.COM—don't ever patch your original.)

The trick is to take advantage of the much-ignored user-defined functions ('PQ', 'PW', 'PE', and 'PR'). If you want to print out a Greek Π , for instance, you can patch 'PQ' to do it by typing in everything below, hitting the Enter key at the end of each line:

```
DEBUG WS.COM
E 77F 1
E 780 E3
W
Q
```

■ It's a fairly straightforward matter to have WordStar print out real borders, made up of high-bit characters, on any printer that is closely IBM-compatible.

Whenever you want to have Π printed out, type Ctrl-PQ (which will show up on the screen as 'Q'). After making the above patch, get into WordStar and type

```
The value of 'Q' is
3.1415926 . . .
```

If your printer can handle it, it will print out a Π in place of the 'Q'.

Each of the user-defined functions will send up to four characters—including high-bit characters—to your printer. Each patch area is 5 bytes long. The first byte tells WordStar how many characters to send. The next 4 are for the actual characters themselves: The 5 bytes triggered by 'PQ' begin at &H77F, 'PW' at &H784, 'PE' at &H789, and 'PR' at &H78E.

To create a very thick-bordered box, type in everything below, hitting the Enter key at the end of each line:

```
DEBUG WS.COM
E 77F 1 DC
E 784 1 DB
E 789 1 DF
W
Q
```

After making these patches, to put this thick border around the letters "PC," get into WordStar and type the following, making sure to hit 'P' before any of the other characters below:

```
'Q'Q'Q'Q'Q'Q'Q'Q'Q'Q
'W      'W
'W PC  'W
'W      'W
'E'E'E'E'E'E'E'E'E'E
```

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This will appear on your printer as:



Remember that you actually type Ctrl-PQ to have a "Q" appear on the screen, u Ctrl-PW for a "W", and a Ctrl-PE for a "E". The reason the top and bottom lines look longer than the ones in the middle is that "Q" is actually one character but takes two spaces to display on the screen. The "PC" and the three spaces on each side of it take up a total of eight single-digit characters. The two "Ws" sandwiching them take up four places on the screen but really represent only two characters. This gives a total of ten characters, the number of "Qs" and "Es". Try it; you'll get the hang of it.

Creating more-conventional boxes with thin, single-character lines is a bit trickier, since such boxes are made up of six pieces—four corners, a horizontal line, and a vertical line. The user-defined functions can take care of four of these. You can convert the ribbon-color taggle ("PY") into the remaining two. Since "PY" is a toggle, the first time you type it WordStar will send the first set of characters to the printer; the next time WordStar will send the second set.

To patch WordStar to make a thin box, type in everything below, hitting the Enter key at the end of each line:

DEBUG WS.COM

E 793 1 DA

E 798 1 BF

E 77F 1 C4

E 784 1 B3

E 789 1 C0

E 78E 1 D9

W

Q

Once you've made these patches, to put such a thin box around the letters "PC," get into WordStar and type the following, making sure to hit "P" before any of the other "characters" below:

'Y'Q'Q'Q'Q'Q'Q'Q'Q'Y

'W' 'W' 'W'

'W' PC 'W'

'W' 'W' 'W'

'E'Q'Q'Q'Q'Q'Q'Q'Q'R

This will appear on your printer as



Remember, the "Y" at the beginning of the top line and the "Y" at the end of the same line will produce different characters on your printer, since WordStar treats it as a toggle. And note that again, while the top and bottom lines will appear to be longer than the ones in the middle, this is because they are made up exclusively of characters that take two positions to display, while the three middle lines are not.—P.S.

UNDERLINE FIND FOUND

It's not possible to find occurrences of the WordStar "S" underline character using the "QA REPLACE or the "QF FIND" commands, since WordStar has reserved "S" to locate strings with any character not a letter or digit. (This is called the "any symbol" option, and since the word "symbol" starts with the letter S, MicroPro unfortunately chose "S" as the code for this operation.)

In the February 5, 1985, issue of PC Magazine (page 280), Ta-Chang Lin outlined a method for finding the "S" character. His trick used the Alt key to enter the three digits 147 on the number pad. Although this method is effective under certain circumstances, there are two problems with it. First, it's troublesome to remember and requires four keystrokes. Second, it does not work with certain memory-resident programs (for example, it conflicts with Prakey on my system).

A better solution is to change WordStar so it asks for a key other than "S" for its "any symbol" operation. To do this, make a copy of the WSOVL1.OVR overlay file, put it and DEBUG.COM on the same disk, and type everything below, hitting the Enter key at the end of each line:

DEBUG WSOVL1.OVR

E 29D5 19

W

Q

This replaces "S(&H13) with "Y(&H19) in WSOVL1.OVR.

After you make the change, you can find occurrences of "S" by specifying "P S

■ POWER USER

double-dot command at the beginning of a line and follow it with a number.

To jump to the marker, use the "QF command. When prompted with FIND? answer "...# (substituting the number you want for the #). Or, if you have trouble remembering which numbered markers are which, replace the numbers with keywords. Note that you'll have to send the search in the proper direction; if you're near the end of the file and your marker is near the beginning, you'll have to specify B to search backward when "QF asks you for OPTIONS?.

Christian E. Rasmussen
Havelock, North Carolina

Double dots are extremely useful both for pluce-finding and for leaving notes to yourself. But WordStar's "K#! Q# marker system is far better, since it's blazingly fast and doesn't force you to go through the multistep "QF process to find each.

■ There's a simple way to put as many permanent markers in your WordStar text as you want—just use nonprinting double-dot comments.

In fact, few users ever take advantage of more than two or three in a single document. Since WordStar has provisions for ten built in, most of you are wasting valuable space on your keyboard dispatch table that could be put to far better use.

As an example, a very useful (and little-

used) command is "QY, which deletes to the end of the line. And few users ever need the grave accent (backward apostrophe). WordStar has room built into the keyboard dispatch table for redundant entries, starting at location &H649. However, this space is often used for other purposes; in "Notes from the UnderGround WordStar" (PC Magazine, Volume 5 Number 2), Ward Starr and Mel Murch tell how to add four extra function keys here.

Let's assume you never use all ten "K# place markers. Here's how to take the space in the table reserved for the tenth place marker ("K9) and change it so that hitting the " key deletes to the end of the line:

Each entry on the table is composed of four bytes. The first two bytes are for the trigger, the key(s) you hit for the desired action. If your trigger is only one character long, the second byte is blank. The third and fourth bytes are for the address

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CIRCLE 344 ON READER SERVICE CARD

of the actual routine that does the work.

First we have to find out the address of the delete-to-end-of-line routine. The trigger for this routine, "QY," is located in the keyboard dispatch table at &H541 ("Q") and &H542 ("Y"). The address of the actual routine is in the two following locations: &H543 and &H544. Using DEBUG to snoop at those addresses tells us the routine address is stored as 46 02.

Next we have to locate the address of the tenth (and least frequently used) place-marker trigger. "K9" is located at addresses &H595 ("K," or &H0B) and &H596 (9, or &H39). The rest is easy. The hex value of "is" &H60. So we replace the &H0B at address &H595 with &H60, and since "is" is a one-key trigger, we replace the old second key &H39 value at the &H596 address with a 0. Then in the following 2 bytes, we insert 46 and 02, the address from the "QY" table entry.

The whole process is simple to execute.

■ Double dots are useful both for place-finding and for leaving notes to yourself. But WordStar's system is better, since it's blazingly fast.

Put a copy of WordStar's WS.COM file on the same disk as DEBUG.COM and type

```
A>DEBUG WS.COM
-E 595 60 00 46 02
-W
Writing 5380 bytes
-Q
```

If you really do use only two or three "K#1" "Q#" placemarkers, you can easily gain more than a dozen such redundant keystroke commands by working backward and replacing all the "K#s" and "Q#s." A partial chart of the starting addresses of each 4-byte entry is:

'K9	&H595	'Q9	&H4F5
'K8	&H591	'Q8	&H4F1
'K7	&H58D	'Q7	&H4ED
'K6	&H589	'Q6	&H4E9
'K5	&H585	'Q5	&H4E5

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■ EDITED BY PAUL SOMERSON

USER-TO-USER



Search inside "unreadable" files for text; customize your cursor or make it disappear; and make your system boot exactly the way you want it to.

TROJAN HORSE HANDLER

I needed a way to look inside nontext files to see what text messages were there and wrote the TEXTHUNT.BAS program in Figure 1 to do it for me. This program scans through files and prints out only the readable lines of text. It's fairly speedy, since it uses a machine language subroutine to do the actual filtering. Once you've typed the program in, try it on a binary file like COMMAND.COM and you'll see just the text and messages buried inside it.

Joe Tamburino

Westford, Massachusetts

This is especially useful in detecting dangerous "Trojan Horse" programs found on computer bulletin boards (they're called Trojan Horse programs because unsuspecting users bring these hidden dangers into their systems from the outside world). In PC News (Volume 4 Number 15, page 33), PC Magazine editors alerted the computer community to this problem; the report quickly made it to dozens of newspapers and magazines. What happens is that some public-domain programs actually damage systems by erasing files or overloading hardware. Our editors suggested that users look at any unfamiliar public-domain code for telltale signs, such as messages like "Gotcha!" or, in one case, "Arf Arf." However, scanning through a questionable file with a tool like DEBUG can take a long time; TEXTHUNT does it in seconds.

You can redirect the output of TEXTHUNT to a file or to your printer in DOS 2.0 or later by invoking the program with

```
100 'TEXTHUNT.BAS -- by Joseph Tamburino
110 DEFINT A-Z:DEF SEG=&H1B94:PK=&H100:ON ERROR GOTO 360
120 READ Z$:IF VAL(Z$)<8 THEN 140
130 POKE PK,VAL("&H"+Z$):PK=PK+1:GOTO 120
140 FILTER.LOOP=&H100
150 SCREEN 0:WIDTH 80:COLOR 7,0:CLS:KEY OFF
160 CLOSE:PRINT"Change directory (Y/N)? ";
170 A$=INKEY$:IF A$="" THEN 170
180 IF A$="Y" OR A$="y" THEN CD=1:GOTO 210
190 IF A$="N" OR A$="n" THEN CD=0:GOTO 210
200 GOTO 170
210 IF CD=1 THEN LINE INPUT "New directory: ";Z$:CHDIR Z$
220 CLS:PRINT "Enter file to search (or type DIR ";
230 INPUT "for directory, or END to end): ";Z$
240 IF Z$="END" OR Z$="end" THEN END
250 IF Z$<>"DIR" AND Z$<>"dir" THEN 280
260 CLS:FILES:PRINT:PRINT "Hit any key to continue."
270 WHILE INKEY$="" :WEND:GOTO 220
280 OPEN Z$ FOR INPUT AS #1:CLS
290 PRINT "ASCII characters and CRLF's in file:":PRINT
300 IF EOF(1)=-1 THEN 340 ELSE LINE INPUT #1,Z$:FLAG=1
310 CALL FILTER.LOOP(Z$,FLAG)
320 IF FLAG=0 THEN 300 ELSE GOSUB 400
330 IF EOF(1)=-1 THEN 340 ELSE 300
340 BEEP:PRINT:PRINT "Done reading file; hit any key."
350 WHILE INKEY$="" :WEND:GOTO 150
360 PRINT "Error in line":ERL
370 PRINT "Hit any key to restart, or 'R' to try again."
380 A$=INKEY$:IF A$="" THEN 380
390 IF A$="R" OR A$="r" THEN RESUME ELSE RUN
400 IF LEN(Z$)>255 THEN PRINT Z$:RETURN
410 FOR J=1 TO 255:PRINT MID$(Z$,J,1):NEXT:RETURN
420 DATA 55,8B,EC,8B,5E,08,8A,0F,8B,57,01,8B,DA,B5
430 DATA 80,8B,00,00,B2,1F,3A,17,7C,03,EB,13,90,B2
440 DATA 80,3A,17,7C,03,EB,0A,90,FE,C8,3A,17,7C,20
450 DATA 43,EB,E5,B2,8D,3A,17,74,F1,B2,0A,3A,17,74
460 DATA EB,B2,09,3A,17,74,E5,8B,5E,06,B8,00,00,89
470 DATA 07,EB,01,90,5D,CA,04,00,2D,-1
```

Figure 1: TEXTHUNT.BAS program to scan through files for recognizable text and messages. The output normally goes to your screen; to redirect it to a file or your printer in DOS 2.x or later, type `BASICA TEXTHUNT > FILENAME` (substituting a real filename for FILENAME) or `BASICA TEXTHUNT > PRN`.



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■ USER-TO-USER

BASICA TEXTHUNT > FILENAME

(substituting a real filename for FILE-NAME), or

BASICA TEXTHUNT > PRN

While **TEXTHUNT** does work as advertised, it doesn't get along with some commercial programs. My copy of **WordStar** locks up after I run **TEXTHUNT**. If this happens, no damage will result, but you'll have to reboot.

CURSOR CLEARER

There are times when you don't want a blinking cursor on-screen. The **CURSOR.SCR** script in Figure 2 creates a simple **NOCURSOR.COM** program to turn the cursor off and an equally simple **CURSOR.COM** program to turn it back on. To create these, type **CURSOR.SCR** using a pure ASCII word processor, or use the **DOS COPY CON:** command. Then make sure **DEBUG.COM**, Version 2.0 or later, is on your disk and type

DEBUG < CURSOR.SCR

Michael J. Mefford
Glenden Beach, Oregon

The example Mr. Mefford provides takes advantage of BIOS service 1 and is strictly

```
A 100
MOV CX,2000
MOV AH,01
INT 10
INT 20
```

```
N NOCURSOR.COM
RCX
9
W
A 100
MOV CX,0607
```

```
N CURSOR.COM
W
Q
```

Figure 2: **CURSOR.SCR** to create **NOCURSOR.COM** to remove the usual blinking cursor, and **CURSOR.COM** to restore it. Type in the file, making sure to leave a blank line above each of the two **N** instructions and hitting the Enter key after each line—especially the last. Then put any version of **DEBUG.COM** 2.0 or later on your disk and type **DEBUG < CURSOR.SCR**

for color/graphics adapters. As many users know, the cursor size can easily be adjusted, but must be handled differently on color and mono systems. The color cursor is made up of 8 lines, while its mono cousin takes up 14. The top line of each is line 0; so the bottom color line is 7 and the lowest mono line 13.

To use BIOS service 1, put the starting line in register **CH** and the stopping line into **CL**. The normal color cursor start/stop is 6/7. The normal mono cursor is 12/13. As Mr. Mefford illustrates, putting a **&H20** (decimal 32) into **CH** and 0 into **CL** will make the cursor vanish from the screen completely.

You can produce cursors of odd shapes by changing the 0607 value in the **MOV** instruction. It's simple to experiment with different values by using the **BASIC**

LOCATE ...start,stop

statement to figure out which numbers you want, then plugging them into the **MOV,0607** instruction in **CURSOR.COM**.

PC À LA MODE

The normal boot routine usually puts systems with color/graphics adapters into color or text mode even if a black-and-white monitor is attached. This forces users with black-and-white monitors to use the **DOS MODE BW** command to change the mode so that color text can be read properly. Because many user programs, such as *Side-Kick*, check the video mode when loading to decide whether or not to use color in their own direct screen updates, it is important to ensure that this black-and-white video mode is properly selected before such memory-resident routines are loaded.

However, while it's easy to put such a **MODE** command in an **AUTOEXEC.BAT** file, such files can become irritatingly long. And each time the system boots it has to grind through the **MODE** switch. One way to avoid this is to make your boot programs set your video mode to suit your monitor. To do this, use **DEBUG**, Version 2.0 or later, to modify the boot record on one of your bootable system diskettes in drive A:.

First, load **DEBUG**, and type

L 100 0 0 1

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■ USER-TO-USER

to load the drive A: boot record. Then type

```
U 100 101
```

to display the initial JMP. You'll see something like JMP 012B. Write down the hex number after the JMP. Then type

```
A100
```

to get into DEBUG's mini-assembler. Follow this with

```
MOV AX,2  
INT 10
```

hitting Enter after each. Then, substituting the number you wrote down at the beginning of this process for the xxxx, type

```
JMP xxxx
```

and hit the Enter key twice. Finally, to make the change permanent, type

```
W 100 0 0 1
```

to write it to the disk in drive A:, and then,

to quit from DEBUG, type

```
Q
```

Be sure to hit Enter after each line.

You can then use the DOS SYS.COM program to copy this updated boot record to other diskettes you use for booting up the system. This technique works with all versions of PC-DOS. The new instructions are written over the boot program's name, which serves no real function.

Leo Forrest
Everett, Washington

Whenever you use DEBUG's (W)rite command, be extremely careful. Writing to 0 means drive A:, 1 means drive B:, and 2 means drive C:. If you load data off a floppy and write it back to a hard disk, you can create all sorts of trouble for yourself.

Mr. Forrest's technique uses service 0 of BIOS Interrupt H10 to set the video

mode. You can experiment with this and boot your system into different modes by changing the MOV AX,2 instruction. Replacing the 2 with a 0 or 1 yields 40-width screens (the first in B&W, the second in color). An AX of 2 (as above) boots the system up in 80-width B&W, while 3 yields 80-width color. A value of 4 gives medium-resolution color graphics; 5 yields medium-res B&W graphics; 6 sets the high-resolution screen. A 7 is especially for mono. Other higher-number modes are for the PCjr and/or the EGA.

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■ EDITED BY CHARLES PETZOLD

PC TUTOR

The right way to organize and navigate your way around a hard disk; how to protect your screen from phosphor burn; and why strange files appear when you use MORE in DOS 3.1.



HARD DISK ORGANIZATION

What is the best way to organize a hard disk; that is, how many subdirectories, where to put files, and so on?

Ken Bryan
County Kildare, Ireland

Hard disk organization is an extremely important topic but is rarely discussed because every user's needs are different. The only completely general answer is that the best way to organize a hard disk is the one that works for you. Indeed, even this is a dynamic process. It makes sense to start off simple. Add more directories until it becomes a chore to search for a particular file. Periodically clean up and reorganize. For help in directory reorganization, PC Magazine editor John Dickinson's RED program redirects files from one directory to another without actually copying them. You can download RED.COM by modem from the PC Magazine Interactive Reader Service ((212) 696-0360), or obtain a corrected copy of its assembly language source code by sending an SASE request to our Technical Editor (One Park Ave., New York, NY 10016).

It's generally a good practice to put each large application program you buy and install on your hard disk in its own directory. The hard disk installation programs that come with these programs usually assume that you're doing this. Many will not work unless all the files the program needs are in the same directory.

After you accept that fact of life, it is often easiest to keep the data files you create with the application program in the same

subdirectory as the application program itself. If you start getting too many data files, separate them into categories and split off some subdirectories from the application directory.

For starters, then, depending upon the applications you use, you might create the following directories on your hard disk:

- DOS — All PC-DOS programs
- UTIL — Small utility programs
- BATCH — Batch files
- LOTUS — Lotus's 1-2-3 and worksheets
- DBASE — dBASE II and databases
- WS — WordStar and text files
- BASIC — Compiler and programs

The DOS directory contains all the programs included on the two PC-DOS diskettes (or their equivalents, if you're using MS-DOS). Keeping all these files isolated in one directory will help if you upgrade to a higher DOS version in the future. UTIL

might contain small utility programs such as those that appear in PC Magazine's User-to-User and Programming/Utilities columns. I'll discuss the BATCH directory shortly. The other four directories would contain all the files associated with those well-known packages.

I like to have a nearly empty root directory. The only files you really need in the root directory (besides the two hidden PC-DOS files) are COMMAND.COM, AUTOEXEC.BAT, and CONFIG.SYS. You can create the CONFIG.SYS and AUTOEXEC.BAT files with EDLIN or any text editor that creates an unformatted ASCII file (for instance, with WordStar in its nondocument mode).

At a minimum, your hard disk CONFIG.SYS file should contain the lines:

```
FILES=20
BUFFERS=20
```

If you've been using a hard disk without a BUFFERS statement in a CONFIG.SYS file, you are going to be amazed at the difference in disk access time that simple statement makes.

You may also have some DEVICE= lines in the CONFIG.SYS if you have a mouse, use a RAMdisk, have an expanded memory board, or use ANSI.SYS. Although CONFIG.SYS must be in the root directory of your boot disk, these device files themselves don't have to be. For instance, to install a 128K RAMdisk under PC-DOS 3.0 and 3.1, you can use the line

```
DEVICE=C:\DOS\VDISK 128
```

in your CONFIG.SYS. The VDISK pro-

■ It's generally a good practice to put each big application program you buy and install on your hard disk in its own directory.

ing the knob counter-clockwise during periods when you're not using the machine prevents the problem from occurring. Proper use of this brightness knob should allow the monochrome display to last for years. Leaving the display sitting for hours with a blindingly bright spreadsheet on it could cause burn-in to be visible within a few weeks, if not days.

Several public-domain utilities are available that shut off a monochrome display attached to the IBM Monochrome Adapter after a certain period has elapsed when nothing has been typed on the keyboard. Pressing any key turns the display back on. These utilities will not work on

■ **Phosphor burn is when you come into work and see a spreadsheet on the monochrome display even though the machine has been off all weekend.**

the Enhanced Graphics Adapter. Technically, screen-blanking utilities for the Monochrome Adapter can shut off the display by writing a 0 to bit 3 of output port 3B8h. This bit disables the video signal. Port 3B8h does not exist on the Enhanced Graphics Adapter. Although these screen-blanking utilities have no effect on the EGA, some of them have very serious effects when used with a Hercules Monochrome Graphics Adapter.

Like everything with the EGA, disabling the video signal is more complex than with the Monochrome or Color Graphics Adapters. Although I experimented with writing a comparable screen-blanking utility for the EGA, it quickly became longer than I wanted it to be, so I decided that turning down the brightness control was the best approach to the problem. You might look at it this way: if you accidentally do leave the display at high intensity and cause some phosphor burns on your monochrome monitor, that will give

you an excellent excuse to buy an Enhanced Color Display, which is the perfect companion to your EGA.

STRANGE FILES WHEN PIPING

I've recently upgraded to DOS 3.1, but when I enter the command

TREE/F | MORE

I get an unusual display. The root directory file listing, which is displayed for the first time under DOS 3.1, shows up normally when I don't use the MORE filter, but it contains two 8-digit hexadecimal numbers when I use MORE. Repeating the command produces different hexadecimal numbers. They don't appear to cause any harm, but what are they and where do they come from?

David Amerson
North Augusta, South Carolina

DOS filter programs work by directing output from one program, in this case TREE, to become input for another program, in this case MORE. COMMAND.COM manages the piping by saving the output from TREE in a temporary disk file and then retrieving this file for input to MORE. The 8-digit hexadecimal strings you noticed are actually filenames created during this process. DOS 3.x uses the PC's clock to derive names for the temporary files. That's why they look like numbers. (DOS 2.x uses temporary filenames with the word PIPE in them, which at least gives a hint of what they are.) If you pipe DIR through MORE on the root directory, you'll see these two files listed as having 0 bytes because they've been created but not yet closed. After MORE runs, COMMAND.COM deletes the files.

If you undelete the files, using The Norton Utilities, you'll find that one of the files has all the piped data in it. Since only one file is needed, the big question is: what does the second file contain? The answer: Nothing. It's interesting, isn't it, how solving one mystery usually reveals another.

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The PC Tutor solves practical problems and explains points of general interest. To see your questions answered here, drop a line to PC Tutor, PC Magazine, One Park Avenue, New York, NY 10016.

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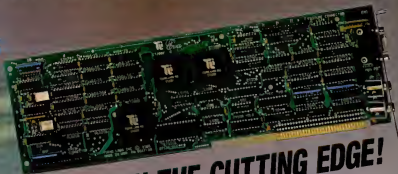
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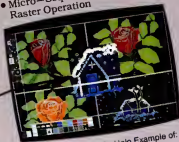
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Redwood City, CA 94063
(800) 677-5335

System Requirements: Station 1: IBM PC, XT, AT or compatible 386K, 10MB hard disk. Station 2: IBM PC, XT, AT or compatible 320K. Plus suitable networking hardware.

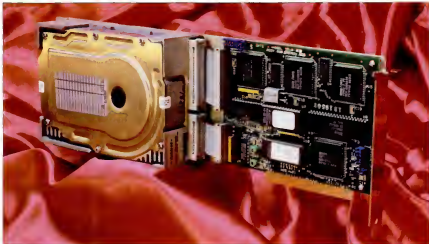
Notes: *ADPNC is standard, while VT100, 3270 SNA, and Remote Access are purchased separately. **Tested applications include dBase III Plus, MultiMate Advantage, Open Systems Accounting, DisplayWrite 3, WordPerfect, MS Word, Lotus 1-2-3, AutoCAD (version 2.0).

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Gold Cards are formatted to run PCDOS 3.3 K when shipped from SVC.

CIRCLE 111 ON READER SERVICE CARD

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PC MAGAZINE REVIEWS IN BRIEF

Primage 100: A Daisy Wheel That Can Hammer Out Graphics, Too

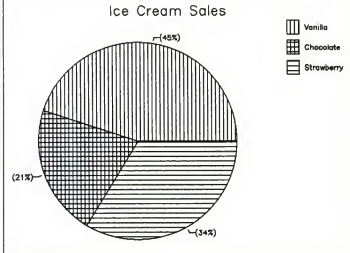
BY M. DAVID STONE

File this one under "What do you do for an encore?" In the 1985 *PC Magazine* printer project, the Primage 90 was an easy pick for Editor's Choice. This \$1,492 daisy wheel printer offered quiet, reliable, fully formed character printing at a measured speed of 50 characters per second. And because Primages stresses printer systems, rather than just printers, options included a bidirectional tractor feed and single-, double-, and triple-bin sheet feeders at prices that ranged from \$295 to \$795.

55 CHARACTERS PER SECOND

What Primages did for an encore was add graphics. Make no mistake: the \$1,895 Primage 100 Daisy/Grapher is a sufficiently impressive performer for its letter-quality printing alone. Like the Primage 90, it offers quiet, reliable printing and low-cost sheet feeders. It even adds more speed. The PC Magazine Labs test clocked this machine at 54.8 characters per second. This is just 8 characters per second below the fastest daisy wheel printer tested at PC Magazine Labs.

Like the Primage 90, the Primage 100 is



The Primage 100 Daisy/Grapher prints characters fast and produces great daisy wheel graphics.

compatible with Diablo 630 control codes. This means that virtually any word processor can make full use of the Primage 100's features for letter-quality printing. Then, at the flip of an easily reachable DIP

switch, the Primage 100 Daisy/Grapher becomes Epson FX-80 compatible. And in the Epson mode, it will happily print graphics.

(continues)



FACT FILE

Primage 100 Daisy/Grapher

Primages Inc.
151 Trade Zone Dr., Plaza V
Roseton, NY 11774
(800) 821-0066
(516) 585-8200

List Price: \$1,895; bidirectional tractor feed, \$295; single-bin sheet feeder, \$395; double-bin sheet feeder, \$595; triple-bin sheet feeder, \$795.

In Short: As a letter-quality daisy wheel printer, the Primage 100 Daisy/Grapher stands out from the crowd. The Epson-compatible graphics feature is high-quality icing on an already well-baked cake.

CIRCLE 556 ON READER SERVICE CARD

Low-Cost Scanner Digitizes On-Paper Images

BY WINN L. ROSCH

Trim and fast, the Microtek Image Scanner, Model MS-200, digitizes on-paper images for manipulation and printing. Smaller than the average desktop copier or PC system unit, the MS-200 can scan a full 8½ by 11 sheet in about 20 seconds. Resolution is 200 dots per inch—very high but exceeded by most laser printers, which boast 300 dpi.

The MS-200 has only one outward control—an on-off switch. All other aspects of its operation are manipulated by software.

Programs accompanying the MS-200 allow optimum image capture for text, line drawings, and halftones and are capable of compressing text image data. The software does not, however, recognize individual characters as would an optical character recognition (OCR) machine.

(continues)

PRIMAGE

(continued)

SOFTWARE COMPATIBLE In PC Labs' tests, the Primage 100 Daisy/Grapher printed graphics with 1-2-3, SuperCalc 3, PFS:Graph, and Framework II. The printer even handled a software-generated, bit-mapped text font produced by T² Scientific Word Processor.

There are several software packages

that will provide much the same graphics capability for various daisy wheel printers, but the resolution on these packages is subject to hardware limitations. The typical daisy wheel printer has a minimum vertical movement of $\frac{1}{48}$ inch. The Primage 100 has a minimum movement of $\frac{1}{32}$ inch.

Another limitation for graphics on most daisy wheel printers is that there is only one dot to work with—the period on the print wheel. The graphics capability on the

Primage 100 Daisy/Grapher is based on a modified print wheel with three spokes devoted to dots at three different heights. The three dots combine with the vertical movements of the paper to effectively imitate a nine-pin dot matrix printer.

CRISP, DARK GRAPHICS OUTPUT

The printer isn't as fast as the FX-80 (Primages claims it prints graphics at about one-third the speed). But thanks to the daisy wheel technology and the use of carbon ribbons instead of nylon ribbons, the output is crisper and darker than with the FX-80.

Even if you don't need the graphics feature, the Primage 100 is a clear winner in its price class. It's not meant for those who need a lot of graphics on a regular basis. But if you must have a letter-quality printer and would like an occasional graphic without having to buy a second printer, the Primages 100 Daisy/Grapher may be the perfect answer.

MICROTEK

(continued)

IMAGE CONVERSIONS The accompanying software allows a modest degree of image manipulation, including merging text with graphics and image rotation. The greatest strength of the MS-200 package, however, is in its image-converting software, which allows MS-200 files to be interchanged with (and modified by) the paint programs PC Paint and PC Paintbrush and Digital Research's GEM file format. Captured images can also be used as icons within Microsoft Windows.

The software supplied with the MS-200 reviewed here was compatible with the IBM Color/Graphics adapter, Hercules Graphics Card, and Tecmar Graphics Master. Supported output devices include Corona's LP300 laser printer, the Toshiba TN5000-II and Epson FX-100 dot-matrix impact printers, and other printers with compatible graphics control codes. The system requires a serial port or special Microtek parallel port to connect to its host computer, which may be a PC, XT, AT, or compatible.

The MS-200 can scan only single sheets fed through the mechanism by hand. Although the mechanism operated smoothly with most kinds of stock, 180-pound watercolor paper and medium-weight, resin-coated photographic paper caused some jamming, particularly when slightly askew. Obviously, the MS-200 cannot scan solid objects.

The image quality produced by the MS-

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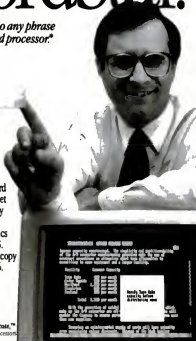
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FACT FILE

**Microtek Image Scanner,
Model MS-200**

Microtek International Inc.
16901 Southwest Ave.
Gardena, CA 90247
(213) 321-2121
List Price: \$1,700

Requires: IBM Color/Graphics Adapter,
Hercules Graphics Card, or Tecmar Graphics
Master.

In Short: A low-cost, single-sheet image
scanner with 200-dot-per-inch resolution.

CIRCLE 848 ON READER SERVICE CARD

200 is on par with other, more-expensive desktop scanners and exceeds the quality that most dot matrix printers can reproduce. Coupled with a laser printer, the MS-200 becomes an extraordinary image manipulator. ■

Alps P2000: A Fast, Reliable Printer

BY WINN L. ROSCH

The manufacturer is new, the printer is new, but it's the same old story—and that's good.

The company is Alps America. Despite the name, Alps offers Japanese rather than Swiss precision. The printer is the P2000, a full-width (16-inch), hulking dot matrix machine that's built as sturdily as any commercial unit. It uses an unremarkable nine-wire printhead and conventional print mechanism. Although that's bad news if you're shopping for innovation, the P2000 rates as great if you want a robust, reliable, and—above all—compatible printer.



FACT FILE

Alps P2000
Alps America
3553 N. First St.
San Jose, CA 95134
(408) 946-6000
List Price: \$995

Requires: Parallel or serial port.

In Short: A sturdy but conventional wide-carriage, nine-wire printer capable of 154 characters per second in draft mode.

CIRCLE 849 ON READER SERVICE CARD

IBM CODE-COMPATIBLE The P2000 understands all IBM commands, characters, and control codes, so it should work with nearly all PC text or graphics programs. It's somewhat faster than the IBM Proprinter—154 versus 132 characters per second tested throughput, 250 versus 200 cps claimed speed—and it offers the additional benefit of good-looking, near-letter-quality, interchangeable typefaces through the use of font cartridges. Three speeds

(corresponding to three print qualities) and three character pitches are standard. Alas, the default letter-quality typeface is an unimpressive sans serif.

The P2000 is well thought out and easy to use. A push or pull (your choice) tractor is built-in, and nearly all features are selectable via a convenient front-control panel. Although it may be overkill for some users, the P2000 may be all the matrix printer a small business needs. [E]

INTRODUCING

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CIRCLE 133 ON READER SERVICE CARD



COMING UP

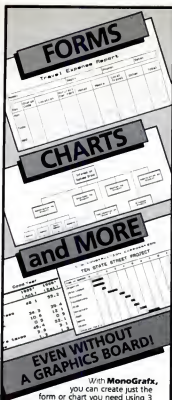
DOS TO GO The new DOS-compatible portable computers are heavier than their lightweight and limited predecessors, but for a few more pounds you can take your office with you. PC Magazine Labs reviews nine DOS-compatible laptop machines with disk drive and monitor docking that push portability into the productivity market.

EXTERNAL DISK/TAPE BACKUP SYSTEMS As personal computers developed into dependable and efficient office tools, the need for safer and more powerful backup systems grew. External combined units offer vast on-line data and program storage, high speed, economical tape backup, and flexibility. They may take up room on your desk, but you won't worry about power or heat build-up or lack of expansion slots. PC Labs tested a slew of external disk/tape backup systems and found ten benchmark-test survivors to review.

PROJECT DATABASE II PC Magazine's blockbuster database project continues with extensive reviews of more than 20 flat-file databases.

I-2-3 TEACHING AND LEARNING AIDS Lotus's I-2-3 spawned a small auxiliary industry of support software. Christopher Barr reviews 23 audiocassette, videocassette, and disk tutorials that help you learn or teach the popular spreadsheet program.

INTERACTIVE READER SERVICE Our little two-line bulletin board was so overwhelmed by callers it was nearly destroyed by its own success. We've spent a lot of time this year upgrading it to three ATs with modems, 18 phone lines, and some new software that lets it handle a lot of callers fast. Christopher Johnston recalls the trials and successes of our IRS board and offers a step-by-step guide to using the service.



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—PC Magazine

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"You have to see it to believe all it can do."—Bay Area PC Newsletter

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—Computer Graphics Today

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1365 Massachusetts Ave.
Boston, MA 02114

CIRCLE 174 ON READER SERVICE CARD

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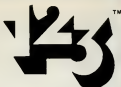
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